Railway Maintenance Engineer

Volume 13 CHICAGO: Transportation Building NEW YORK: Woolworth Building MARCH, 1917 CLEVELAND: Citizens' Building WASHINGTON: Home Life Building Number 3

The First Law Of Safety Is The Maintenance Of Good Track

Since 1843

HUBBARD TRACK TOOLS

have been clearly defined in the minds of all users as all that is excellent in material and workmanship. The growth of this concern from a very small beginning over half a century ago, is based on our continued ability to manufacture a superior product—a product which has materially helped throughout these many years in the efficient and economical maintenance of American Railways.

HUBBARD & COMPANY
Pittsburgh, Penna.

The CINCINNATI FROG & SWITCH COMPANY
MANUFACTURERS OF
TRACK EQUIPMENT
FOR STEAM AND ELECTRIC RAILROADS
MINES AND MILLS

CINCINNATI, OHIO

Frogs *Switches* *Crossings* *Stands*

FROGS — SWITCHES — STANDS

Manganese and Built-Up Construction

IN STOCK for IMMEDIATE SHIPMENT

THE INDIANAPOLIS SWITCH & FROG COMPANY
NEW YORK SPRINGFIELD, OHIO CHICAGO

ESTABLISHED 1882

THE WEIR FROG CO.

Track Work of Rail and Manganese Steel Construction

CINCINNATI --- --- --- --- --- OHIO

THE P. & M. — RAIL ANTI-CREEPERS — THE VAUGHAN

FOR HEAVY SERVICE DOUBLE TRACK.
THE GREATER THE CREEPING TENDENCY, THE GREATER IT GRIPS THE RAIL AND HOLDS.

FOR SINGLE TRACK.
THE ACTION OF A POWERFUL TORSION SPRING KEEPS IT EFFECTIVE UNDER ALL CONDITIONS OF CREEPING.

SOLD BY

THE P. & M. CO.

SAN FRANCISCO
ST. PAUL

RAILWAY EXCHANGE
CHICAGO

NEW YORK
DENVER

A POSITIVE WATER SUPPLY

ABSOLUTELY ASSURED BY

G.-A. Pat. Cushioned Controlling Altitude Valves

(Angle or Straight Way), up to 24 in.

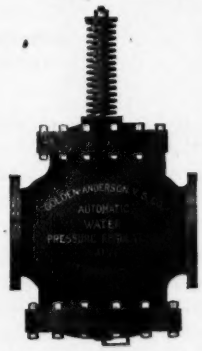
Golden-Anderson Automatic Cushioned Float Valves.

For automatically maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing away with the annoyances of Freezing and Float Fixtures inside or outside of Tanks. "Three Ways of Closing These Valves."

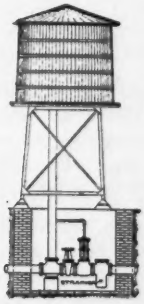
1st—Automatically by water.
2nd—By Electricity, if desired.
3rd—By Hand.

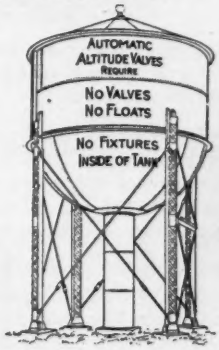
"No Metal-to-Metal Seats"

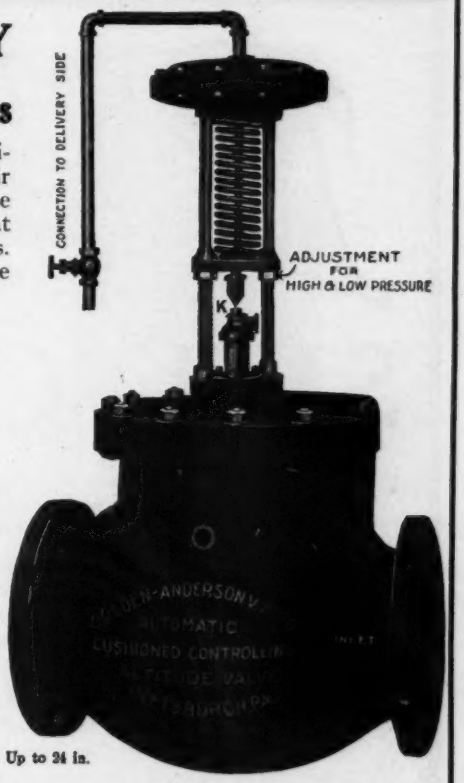
"Hosts of References"



Golden-Anderson Patent Automatic Cushioned Water-Regulating Valves up to 24 in.







Up to 24 in.

Golden-Anderson Valve Specialty Co.

1200 Fulton Bldg. Water and Steam Specialties. PITTSBURGH, PENNA.

KILBY FROG & SWITCH COMPANY

Birmingham, Alabama

Manufacturers of

Frogs, Switches, Crossings, Etc.

Manganese Track Work a Specialty

Front View

For Positive Service

For washeries, in cofferdams, for bridge building, railway tanks, roundhouses, in short, for railway construction work where careful engineers are after positive service, they specify

EMERSON Steam Pumps

Side View

Analyzed from an efficiency point of view, here are the facts: Emerson Standard Pumps have the Emerson Patented Engine and Valve with its positive mechanical motion—thus steam is admitted into the barrels of the pump at positively timed intervals. Furthermore, engine, valve and gear are hermetically sealed—they cannot be injured or become clogged. Designed to handle air, sand, mud, grit, etc., with the water, the EMERSON is in a class by itself, for no other kind or make of pump can equal this performance.

IMMEDIATE SHIPMENTS FROM STOCK. 1917 Catalogue—No. 12—with testimonials from men who know, will be sent on request.

THE EMERSON PUMP & VALVE COMPANY

Alexandria, Va.

Ramapo

MANGANESE TRACK WORK A SPECIALTY

AUTOMATIC SAFETY SWITCH STANDS

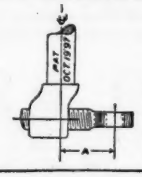
1. POSITIVE THROW.—Ramapo Safety Switch Stands are rigid for hand operation. The operator raises the handle, thereby releasing the spindle from the automatic mechanism, then throws the switch, but cannot lower the handle or relock switch unless the points are fully thrown.

2. AUTOMATIC SAFETY FEATURES.—A train or car can trail through a switch when set wrong, locked with a Ramapo Safety Switch Stand, without breaking the switch points or injuring the switch stand. The first pair of wheels forces the switch points open, compressing springs in the switch stand, and when points are half way thrown the springs snap the points the rest of the way. The stand is left locked in new position, just as if thrown by hand, and is again ready for either hand or automatic operation.

3. ADJUSTABLE FEATURES.—All Ramapo Safety Switch Stands are furnished with adjustable throw and adjustable moving-rods, unless otherwise ordered. Adjustable switch rods are not required, as either switch point can be adjusted. The throw can always be adjusted to suit that of any switch, one-half turn of the eye-bolt crank affecting the throw one-twelfth of an inch. See table of crank adjustments below. The distance of stand from switch can be readily adjusted with the adjustable moving-rod without moving the stand on the ties.

CRANK ADJUSTMENTS FOR RAMAPO SAFETY SWITCH STANDS

THROW OF STAND	"A"		THROW OF STAND	"A"
6½"	2 11/16"		4½"	3"
5½"	2 5/16"		4½"	3 5/16"
5½"	2 1/16"		4½"	3 5/16"
5½"	2"		4½"	3 5/16"
4"	2 1/16"		4½"	3 1/16"
4½"	2 1/16"		4½"	3 1/16"
4½"	3"		5"	3 1/16"



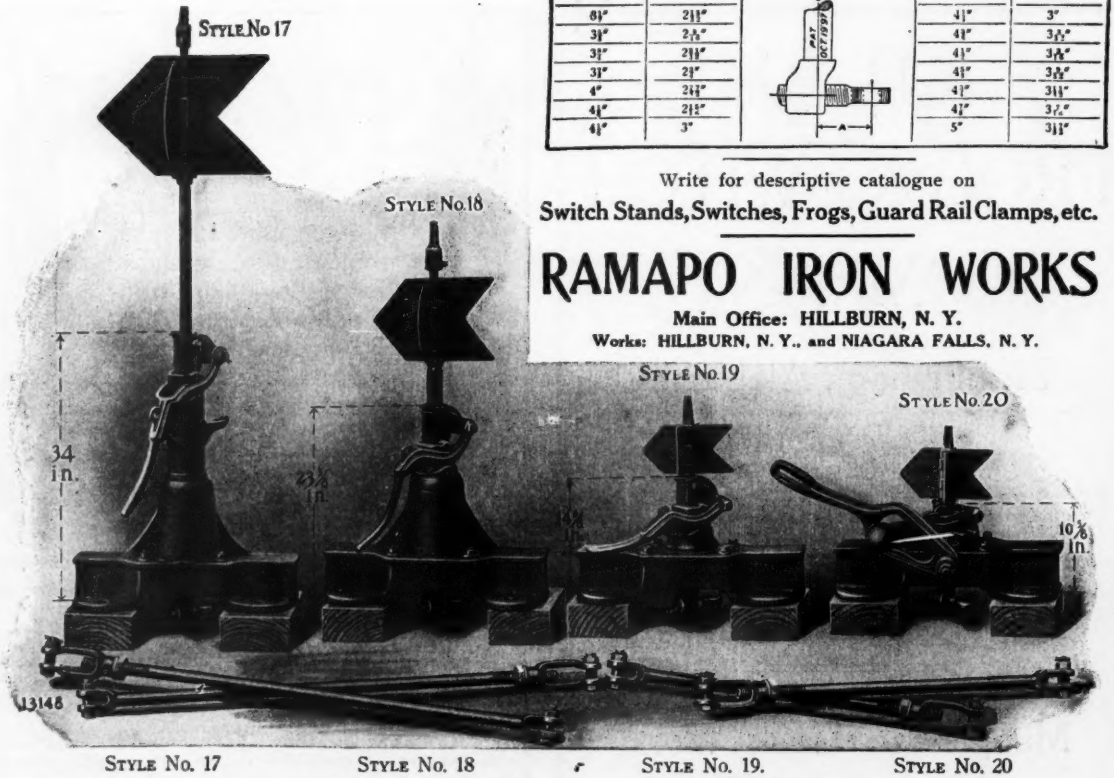
Write for descriptive catalogue on

Switch Stands, Switches, Frogs, Guard Rail Clamps, etc.

RAMAPO IRON WORKS

Main Office: HILLBURN, N. Y.

Works: HILLBURN, N. Y., and NIAGARA FALLS, N. Y.



STYLE No. 17 STYLE No. 18 STYLE No. 19. STYLE No. 20

RAMAPO PATENT SAFETY SWITCH STANDS

Uninjured By Severest Traffic

Crossing foundations that *will not* shift with traffic. That sounds good, does it not, to you men who know so well how wooden tie crossing foundations sink and shift under traffic, almost like the sands of the sea, it seems at times.

You men who know the constant expense and trouble wooden tie crossing foundations entail. How shifting of crossings, combined with rail creeping, requires a gang of men almost constantly to keep the track in good alignment and grade.

Those men have other work to do—then let them "go to it," and at the same time increase the life of your crossings and reduce maintenance charges to a minimum, by the installation of

INTERNATIONAL STEEL CROSSING FOUNDATIONS

which for so many railroads have so greatly cut the expense of one of the most costly items in track maintenance work—maintenance of alignment and surface at grade crossings.

Inexpensive and easy to install. These box girder structures, built up of channels and plates and filled with creosoted wood block to aid in transferring the loads from the top to bottom of plates.

Severest traffic conditions cannot injure International Foundations, that is why maintenance costs go down when these dependable structures go in under your expensive crossings.

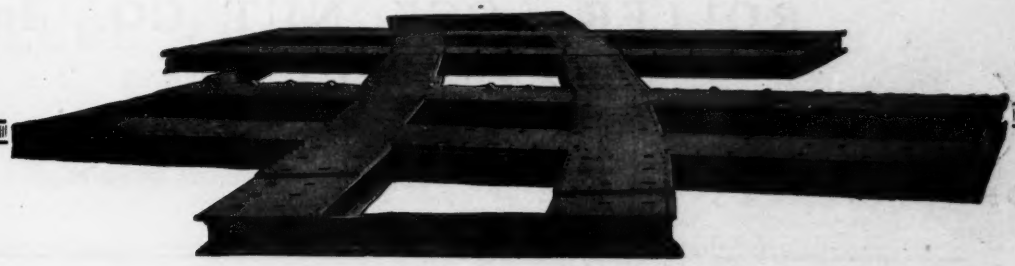
Write now for additional data and list of installations. Delivery three weeks from receipt of order. It's your move if you desire your crossing foundations not to move.

International Steel Tie Company

General Sales Office and Works: Cleveland, Ohio

REPRESENTATIVES

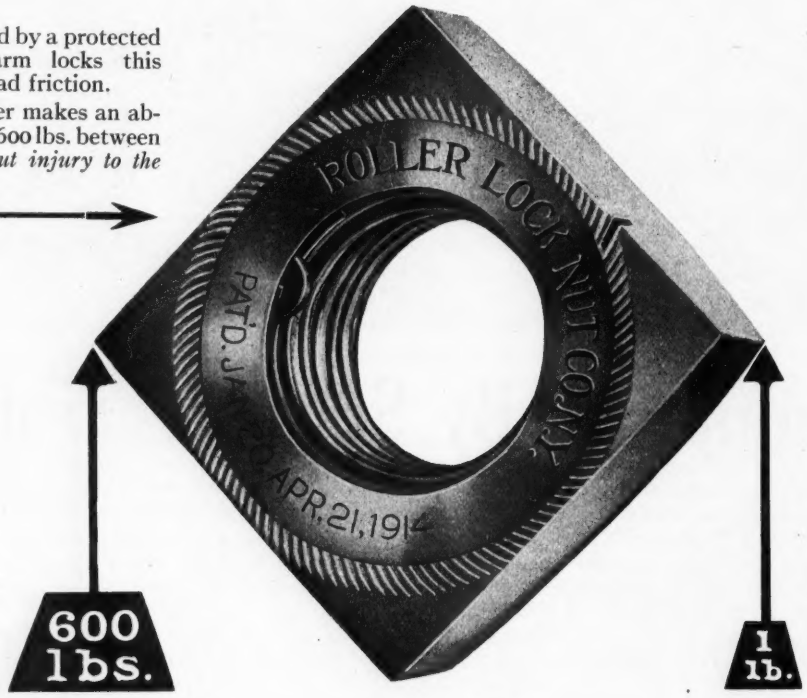
William H. Ziegler, Minneapolis, Minn. | R. J. Cooper Co., Salt Lake City, Utah | Western Eng'g Sales Co. Seattle, Wash. Portland, Ore. San Francisco | J. E. Lewis & Co., Dallas, Texas | Maurice Joy, Philadelphia



You Can Double the Life By Using Roller

This roller held by a protected mechanical arm locks this nut; not thread friction.

The steel roller makes an absolute lock of 600 lbs. between threads *without injury to the bolt.*



600 lbs. at the point required to unlock the Roller Lock Nut.

If 1 lb. is hung on this point, a nut will never back off. The Roller Lock Nut has 600 lbs.

Roller Lock Nuts Tighten Under Vibration

VIBRATION is the poison of track—it kills nuts and bolts, breaks down thread resistance, hence loose nuts and bolts. The Roller Lock Nut can't back off the bolt; for its return is locked absolutely and positively. Under vibration or any movement of the track, the Roller Lock Nut moves forward. Furthermore, it locks on worn bolts with the same firmness as on new bolts. Remember that the Roller Lock Nut is solid and can be re-used and is not injured by removal—nor does it injure the bolt. Fill out the coupon for samples to try out on your most difficult stretches of track.

ROLLER LOCK NUT CO., Inc.

61 Broadway, New York, N. Y.

See our exhibit at Coliseum, Chicago, March 19-22, during the American Railway Engineering Association Convention.

Of Your Bolts and Nuts Lock Nuts

Four Nuts Combined in One Nut

A Positive Nut Lock
A Self-tightening Nut Lock
A Friction Nut
A Plain Nut

Why It Locks

When you receive a sample of the Roller Lock Nut, you will note that there is a roller held by a protected mechanical arm. When the Roller Lock Nut is applied, the roller is in the right-hand recess of the nut. As long as the roller remains in the right-hand position, the nut cannot back off by jarring or vibration, for it locks automatically and stays locked until you want to remove it. To remove the Roller Lock Nut use your track wrench in the same manner that you remove a plain standard track nut. Strong wrench pull slips the roller into the left-hand recess, thus releasing the nut. Your bolt is intact and can be used again. Remember there are no washers necessary; shorter bolts can be used. This Lock Nut not being friction tight can be installed in half the time.

Some of the Advantages of Roller Lock Nuts

1. Absolutely fool proof.
2. Locks on undersized or worn bolts.
3. Requires no counter nuts—hence shorter bolts.
4. Cannot rupture thread of bolt.
5. Costs less than all present methods.
6. Requires a fraction of the time of a plain or friction nut to apply or remove.
7. Can be supplied to fit any thread or bolt.

Fill Out the Coupon for Sample

ROLLER LOCK NUT CO., Inc.

61 Broadway, New York, N. Y.

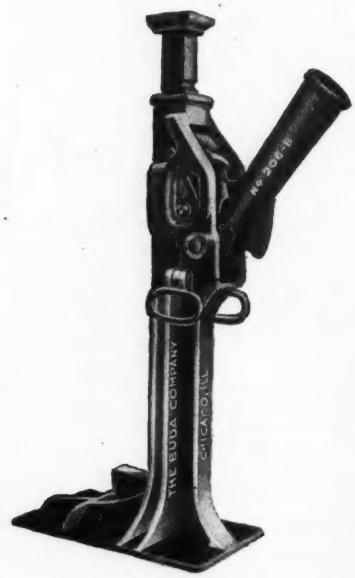
See our exhibit at Coliseum, Chicago, March 19-22, during the American Railway Engineering Association Convention.

ROLLER LOCK NUT CO., INC.,
61 Broadway, New York, N. Y.
Gentlemen: Kindly forward samples of Roller Lock Nuts for track work as offered in your advertisement in the March, 1917, issue of the Railway Maintenance Engineer.

Name.....
Address.....
No. and Size.....
Kind of Work.....

Three New and Improved Buda Jacks

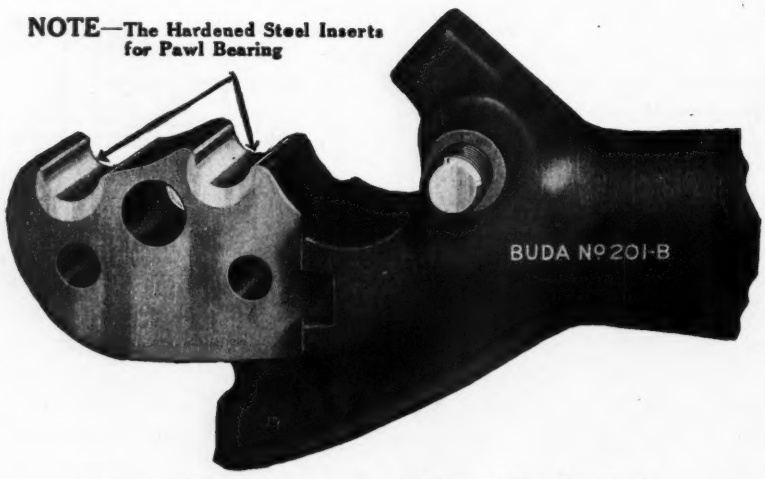
Buda No. 201-B



Buda No. 206-B

Buda No. 219-B

NOTE—The Hardened Steel Inserts for Pawl Bearing



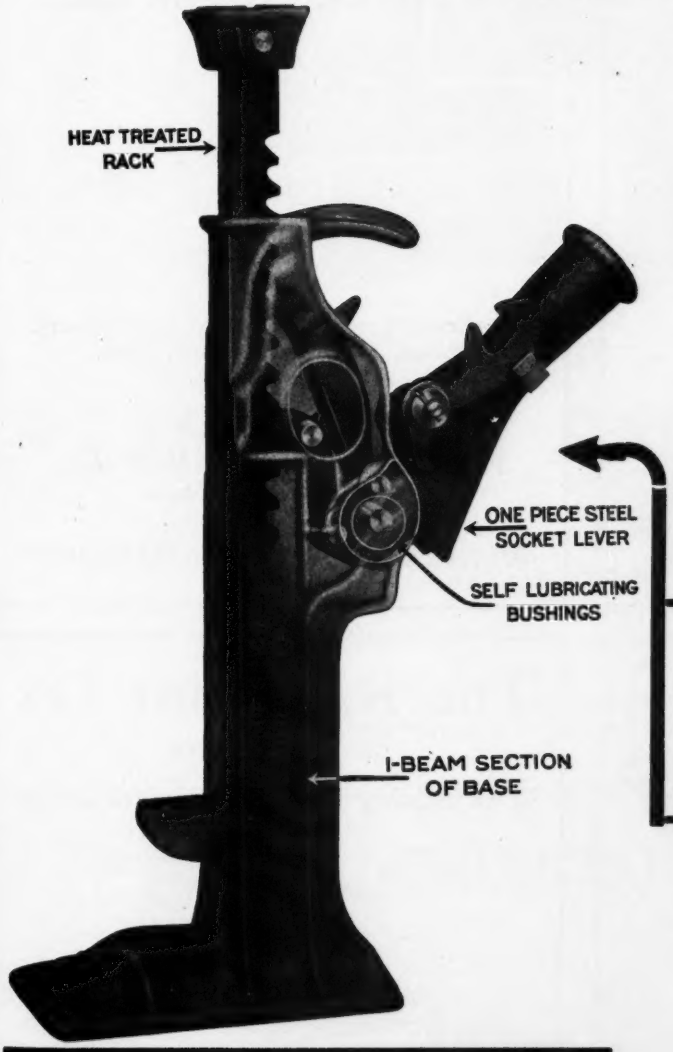
Improved socket lever as used in Buda Ratchet Jacks Nos. 201-B and 206-B

SEND FOR BULLETIN NO. 277

THE BUDA COMPANY

New York **CHICAGO** St. Louis

Over a million BARRETT Jacks in railway service—



The fact that over a million Barrett Jacks have been placed with America's steam and street railways is substantial evidence of their worth.

The chief reasons for their nationwide popularity with railways are (1) their dependability under extreme working conditions, (2) their ability to shoulder their required loads, and (3) their low maintenance cost.

Barrett Jacks are the result of an experience of over 30 years confined entirely to the manufacture and development of Lifting Jacks. Our engineering department is the most comprehensive in the world, devoted exclusively to the study of Lifting Jack requirements and economies.

BARRETT Track Jacks

There are over seventeen different styles and sizes—this is by far the largest assortment of track jacks made by any *one* manufacturer.

This is the Genuine Barrett Improved Track Jack No. 1

Study this Track Jack carefully. Note the many distinguishing features that place it above the ordinary Track Jack. This model is very popular and has been found to be highly efficient in all sections of the country.

The socket lever is in one piece, made of heat treated cast steel—there are no side plates or rivets. Note the self-lubricating bushings.

The leverage is double acting (also made in single-acting sizes), raising the load half a notch on both the upward and downward stroke. The load can be instantly dropped from any elevation.

This is recognized as the *standard* Track Jack; its construction conforms strictly to the requirements of the Roadmasters' Association.

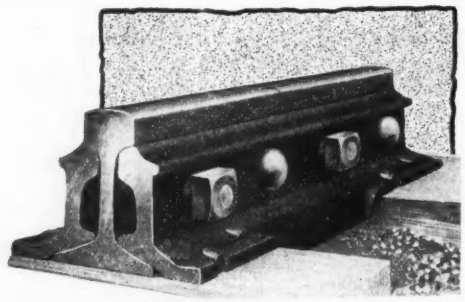
Send for Catalog

Our general catalog is handsomely illustrated and contains complete descriptions of Genuine Barrett Track Jacks, Duff ball-bearing screw jacks, Duff-Bethlehem hydraulic jacks and many other jacks being used by America's leading railways. This catalog will be sent immediately upon request.

THE DUFF MFG. CO.

PITTSBURGH, PA.

50 Church St. NEW YORK
Peoples Gas Building, CHICAGO, ILL.
Candler Building, ATLANTA, GA.
Monadnock Building, SAN FRANCISCO
Pioneer Building, ST. PAUL, MINN.



Rigidity

To efficiently perform its function a rail joint should possess maximum rigidity.

The Thomson patent of distribution of metal together with the vertical depending flange—the exclusively Bonzano design—mean maximum rigidity against all bending strains.

Millions in use prove this fact.

The Q AND C Co.

New York
90 West St.

Chicago
Peoples Gas Bldg.

Bonzano-Thomson Rail Joint

"The Joint as Strong as the Rail"

Q AND C

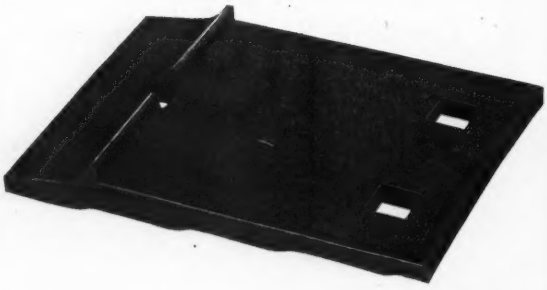
SHERWIN-WILLIAMS

CARBOLIC-OL

WOOD PRESERVATIVE
A PURE COAL-TAR OIL

For Brush Treatment of Bridge Timbers, Poles, Ties, Cross-Arms, Pins, Platforms, Etc.

THE SHERWIN-WILLIAMS CO.
Paint and Varnish Makers
Address Inquiries to
601 Canal Road, N. W. CLEVELAND, OHIO



One of the most distinguished, successful and honored Engineers of the United States, while not wishing his name to appear in an advertisement, writes as follows of The

LUNDIE TIE PLATE

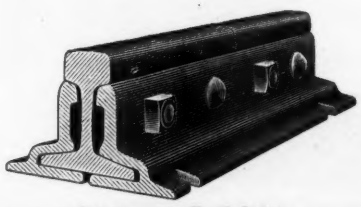
"It is by far the most scientifically designed and practically efficient tie plate ever evolved."

JOHN LUNDIE, 52 Broadway, NEW YORK

The Rail Joint Co.

GENERAL OFFICES:

61 Broadway New York City



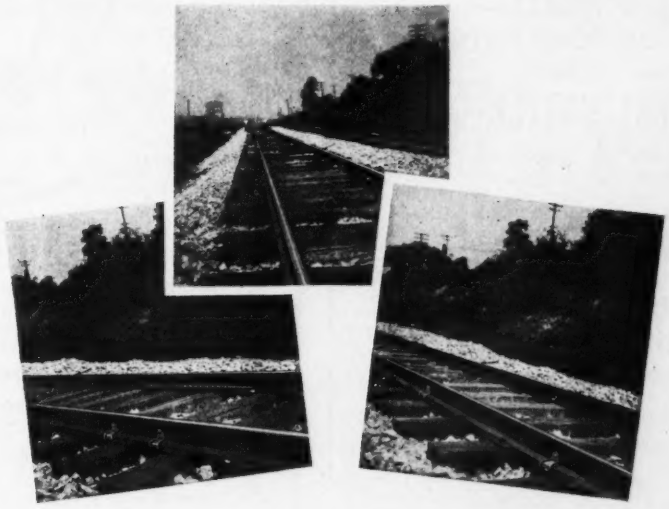
Continuous Rail Joint

Makers of Continuous, Weber, Wolhaupter and 100% rail joints.

Standard—Insulated—Step—Frog and Switch Types.

Grand Prize San Francisco 1915

Protected by Patents



Installations of

EFFICIENCY RAIL ANCHOR

with a service record of

100% Covering 18 Months

Cost
Application
Deliveries

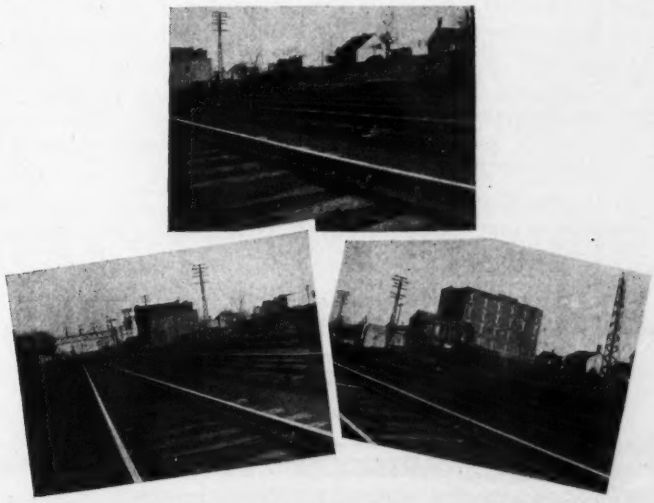
LOWEST NOW

Locations with names of officials given on request

Railway Exchange

ANCHOR COMPANY

Chicago Illinois



Safety First!!—

EQUIP YOUR ROAD WITH

The New 1917 Model

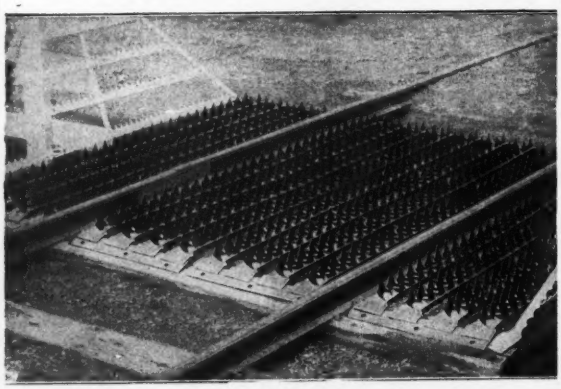
NATIONAL STEEL CATTLE GUARD

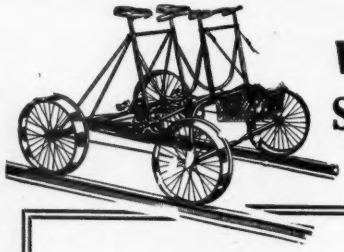
For greatest efficiency at lowest maintenance cost, the new 1917 "National" is without a rival. It positively will turn anything on four feet. The National Steel Cattle Guard is not a flat piece of steel with stuck up points, but a MECHANICAL DEVICE. Made of best grade Open Hearth Steel No. 9 or No. 11 gauge, coated with a secret-process baked-on enamel. Cannot rust or corrode. Quickly installed by unskilled labor. Maintained at low cost and will last indefinitely.

Write for new illustrated circular fully describing why the "National" is the preferred cattle guard of leading railroads.

NATIONAL SURFACE GUARD CO.

209 So. La Salle Street, Chicago, Ill.





Why It Is Satisfactory

Why is it satisfactory? Simply because it is a "Hartley & Teeter" car. That tells the whole story, explains its strength and why it is the lightest running car known to the railroad world.

If your road desires

INSPECTION CARS

which will stand the closest inspection and give long, satisfactory service, send for our new booklet on Cars Which Save and Serve.

Teeter-Hartley Motor Co.

Hagerstown Indiana

DOUBLE END TRACK WRENCH

HUBBARD

Shovels and Track Tools

For over a half century the quality of Hubbard tools has been clearly defined in the minds of the users as all that is excellent in material and workmanship.

All tools manufactured by us are guaranteed to be perfect in workmanship and material; if any prove defective in any way, prompt replacement will be made without charge.

Submit to us your blueprints or sketches of special tools and we will give you the benefit of our experience in designing them for your particular needs. Write for catalogues.

PLAIN BACK SPADE

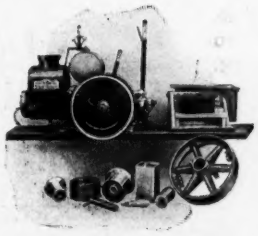
PLAIN BACK SHOVEL

HUBBARD & COMPANY

Pittsburgh Pennsylvania

CLAW BAR

Now Is The Time To Prepare For Spring Track Work

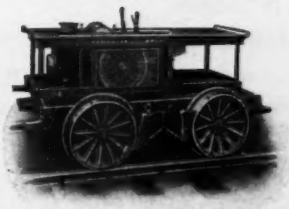


FAIRMONT ENGINES

are used on 511 railroads in North, South and Central America. The thousands of letters we have received from satisfied users, telling of their reliability, economy and pulling power, proved them best for railroad work.
Send for our testimonial folder.

Experience has taught you that the track, bridge and construction gangs must be well equipped when the rush of spring work begins. By equipping your hand cars with FAIRMONT ENGINES these gangs, with tools, materials, etc., can all be taken to the work IN ONE LOAD. Think of what a saving of time this means. On several railroads where Fairmonts are used they have saved thousands of dollars in one season.

FAIRMONT
MOTOR CARS
& ENGINES



MOTOR CARS SECTION

Fairmont Section motor cars are unequaled. They are easy to handle and give maximum power with minimum weight. These cars are made for every branch of track, bridge and construction work.
We are in a position to furnish cars for special purposes and to suit all conditions.

Meet Us At The Railway Appliance Show March 19 To 22 At Chicago Coliseum

The FAIRMONT LINE will be exhibited in booths 125 and 144 at the National Railway Appliance Show. We have some new and mighty interesting things to show this year.

THE NEW FEATHERWEIGHT CAR will be the big feature of the show. Don't fail to see it. If you do you have missed something interesting. It will be the BIGGEST LITTLE CAR THERE.

FAIRMONT GAS ENGINE & RY. MOTOR CAR CO.

FORMERLY FAIRMONT MACHINE CO.

423 N. MAIN ST. FAIRMONT, MINN.

Give the Men a Chance
Give the Gasoline a Chance

The Section Car, be it hand, push or gasoline, goes along day in and day out doing its share to maintain the road-beds of our railroads.

And it's a big share.

The Section Car is greedy for work. Give it a chance.

Man and gas make the Section Cars go.

But without Hyatt Roller Bearings the Section Car can't do its full amount of work.

Without Hyatt Roller Bearings the Section Car is only doing 70% of what it should do.

The 30% is wasted in friction by the plain bearings.

Let Hyatt Roller Bearings save this 30% of energy that is wasted in plain bearings.

* * * * *

And give the men a chance. Men have nerves. Men have muscles. Men are human.

Don't let them fag out by useless work.

Hyatt Bearings will save the men's backs. And the men will produce a bigger and better day's work on maintaining the road-bed.

And that's what you pay them for.

Give the men a chance.

* * * * *

Also give the gas a chance. Don't waste $21,000 on the gas bill every year. Do away with friction and let the gas give all its power to the car.

It has been proven that $70,000 is spent each year for gasoline by the average road. Ask Mr. M. E. Carroll who writes for the "Railway Maintenance Engineer."

Hyatt Roller Bearings will save 30% of $70,000 or $21,000 a year—think of it!

Give the gas a chance.

Hyatt Roller Bearings are the spunkiest bearings under working conditions we know of.

Hyatt Roller Bearings have made good. They deserve a place on every new section car that is ordered and every section car that is already in use.

There may be bearings that will do pretty well.

But pretty well isn't the whole story.

Some bearings (plain and solid roller) do pretty well. But they are lazy.

And you know what this means. A lazy bearing acts like a sled running on dirt. It drags.

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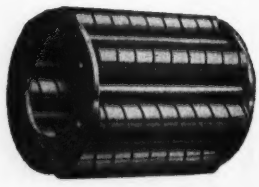

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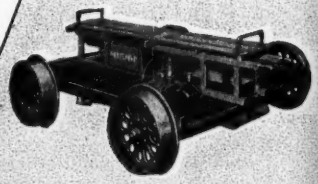
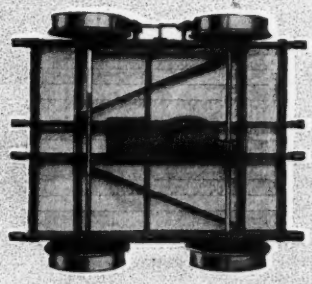
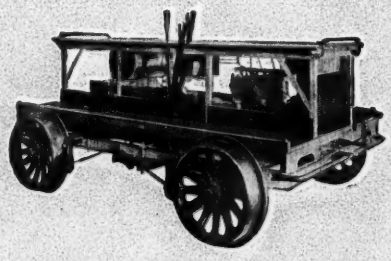


Motor Car (4 Hyatt Bearings)
Mudge & Co.
Chicago, Ill.

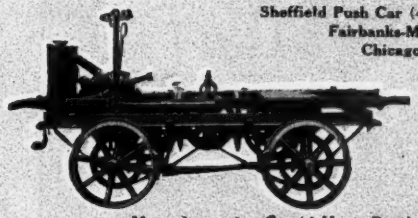


Hand Car (4 Hyatt Bearings)
Kalamazoo Ry. Supply Co.
Kalamazoo, Mich.



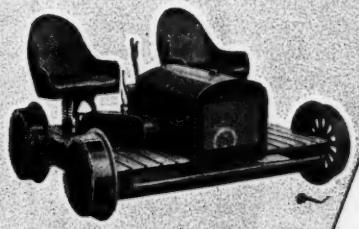
Motor Car (9 Hyatt Bearings)
Kalamazoo Ry. Supply Co.
Kalamazoo, Mich.

Sheffield Push Car (4 Hyatt Bearings)
Fairbanks-Morse Co.
Chicago, Ill.

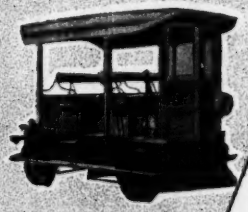


Motor Inspection Car (4 Hyatt Bearings)
Railway Motor Car Co. of America
Chicago, Ill.

Sheffield Motor Car (2 Hyatt Bearings)
Fairbanks-Morse Co.
Chicago, Ill.



Motor Car (4 Hyatt Bearings)
Fairmont Gas Engine and
Ry. Motor Car Co.
Fairmont, Minn.



Motor Inspection Car
(4 Hyatt Bearings)
The Buda Co.
Harvey, Ill.

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—and the manufacturers say

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"We have such faith in the Hyatt Roller Bearing that we have no hesitancy in recommending it anywhere, knowing that it will do all that is claimed for it."

Kalamazoo Railway Supply Company

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The Buda Company

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Mudge & Company

"We are prepared to furnish Hyatt equipped Inspection Motor Cars and have no hesitancy in recommending them to any railroad interested in a minimum gas consumption and maximum satisfaction."

Adams Motor & Mfg. Co.

"We are to announce that we are ready to furnish our motor cars equipped with Hyatt Flexible Roller Bearings. They (Hyatt Bearings) have no equal when it comes to low up-keep cost and durability."

Railway Motor Car Co. of America

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Fairbanks-Morse Company

Send for Bulletin No. 1100, Revised Edition

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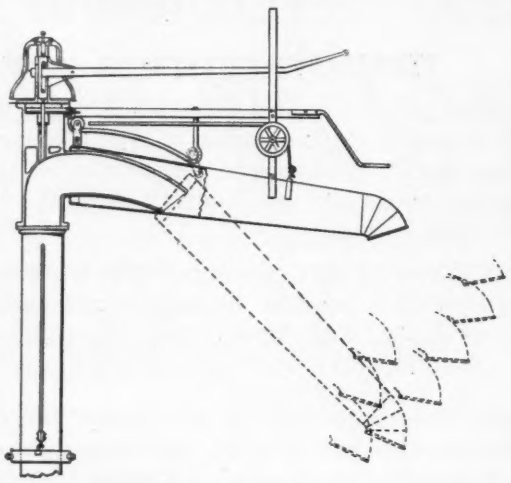

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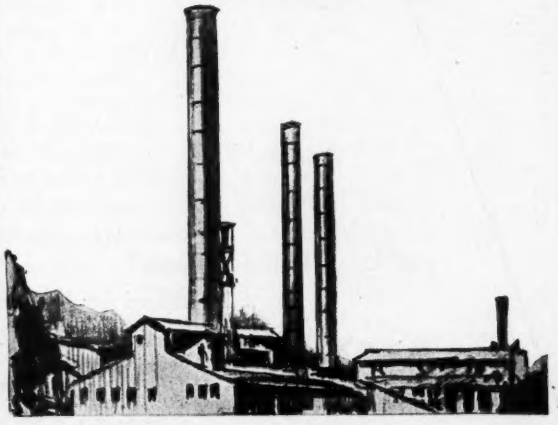
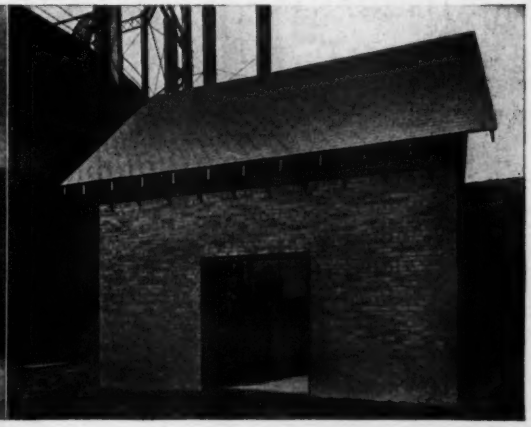


AMERICAN



Delivering 2,750 Gallons of Water a Minute from a Deep Drilled Well

The Sioux City Gas and Electric Company, Sioux City, Iowa, was in need of more water. After studying the performance of a very successful "American" deep-well turbine centrifugal pump installed in the Sioux City waterworks they concluded that a similar installation would furnish them the most economical supply.

Observation of the waterworks well showed a "specific capacity" of 35.5 gallons a minute for each foot of draw-down of the water surface for a depth of water bearing formation of 200 feet. At the proposed site of the Gas Company's installation there was every possibility of obtaining fully this depth of formation. Taking into consideration the difference in elevation of the ground surface between the two points and adding the proper amounts to cover interference of wells of other nearby industries it was estimated that a total operating head based on 2,000 g. p. m. of 100 ft. would be ample to cover the conditions.

A contract was let for a well to be cased about 125 ft. with 26-in. O. D. wrought iron pipe, the remainder of the well to be 18 or 20 in. in diameter. At the same time an order was given for an "American" 24-in., 2-stage, type NTMB, deep-well turbine centrifugal pump, designed to deliver 2,000 g. p. m. against a total head of 100 ft. at 865 r. p. m. with a guaranteed mechanical efficiency of 72%. A 75-hp., 2-phase, 60-cycle, 220-volt, vertical, type CS, Westinghouse, 865 r. p. m., squirrel-cage motor with hand-starting compensator, was ordered to operate the pump.

When the well was completed there was available only about 50 ft. of water-bearing formation, but the well delivered 2,750 g. p. m. continuously whenever in operation. The operating water level is 82 ft. below the surface and the standing level when not pumped is 26 ft., which represents a draw-down of 56 ft., or 49.2 g. p. m. per foot of draw-down.

Water is pumped into a surface reservoir, from which it is taken by other equipment and passes through condensers for condensation purposes.

Cost of pumping, inasmuch as the load shown by an electric motor in the power-house, a short distance away, is 85.3 kw., amounts to .518 kw. hours for each thousand gallons, and the vacuum maintained on the power turbines is 27.5 in. with a 29-in. barometer and 800 kw. on each of the turbines.

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This installation demonstrates the capacity and efficiency of "American" deep-well turbine centrifugal pumps and shows the great economy of obtaining a large water supply from deep wells with them when operating under conditions in which the wells will supply the required quantity of water.

Catalog 132 describes these pumps. Write for your copy.

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Railway Maintenance Engineer

Volume 13 March, 1917 Number 3

(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age Gazette* and *Railway Engineering and Maintenance of Way.*)

Published on the last Thursday preceding the date of issue by the
SIMMONS-BOARDMAN PUBLISHING CO.,
TRANSPORTATION BUILDING, CHICAGO, ILL.

NEW YORK: WOOLWORTH BLDG. CLEVELAND: CITIZENS' BLDG.
WASHINGTON: HOME LIFE BUILDING.
LONDON: QUEEN ANNE'S CHAMBERS, WESTMINSTER.

EDWARD A. SIMMONS, *President.* LUCIUS B. SHERMAN, *Vice-President.*
HENRY LEE, *Vice-President and Treas.* M. H. WIUM, *Secretary*

ELMER T. HOWSON, *Editor.*
WALTER S. LACHER, *Associate Editor* JOHN G. LITTLE, *Associate Editor*

Entered at the Post Office at Chicago, Ill., as mail matter of the second class.

Subscription price, including the twelve regular monthly issues of the *Railway Maintenance Engineer* and the four daily issues of the *Railway Age Gazette*, published in connection with the annual convention of the American Railway Engineering Association: United States, Canada and Mexico, $1.00; foreign countries (excepting daily editions), $2.00.

WE GUARANTEE that of this issue 8,200 copies were printed; that of these 8,200 copies, 7,154 were mailed to regular paid subscribers, 137 were mailed to advertisers, exchanges and correspondents, and 909 were provided for new subscribers, copies lost in the mails and office use.

The *Railway Maintenance Engineer* is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

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Contest on Reclamation of Bridge Materials

The judges who examined the eight papers received in the contest on The Reclamation of Bridge and Building Materials have awarded first prize to C. A. Lichty, general inspector in the purchasing department, Chicago & North Western, and the second prize to J. T. Andrews, assistant engineer, Baltimore & Ohio. These papers will be published in the next issue of the *Railway Maintenance Engineer* and others in later issues. The contributions received bring out a number of interesting practices in the reclamation of these materials and show the economies resulting from the intelligent handling of work of this character.

The Design of Track Spikes

Associations of railway maintenance officers, which include among their most important functions the standardization of maintenance methods and materials, have been in existence for at least a third of a century and their efforts have been fruitful in the introduction of uniformity in both design and practice in nearly all phases of the upkeep of railway track and structures. Standardization is a continuous process and the work can never be said to be finished if we are also to secure advancement and progress. There are, however, certain devices which have been in use so long that there remains little opportunity for improvement other than their absolute replacement or a complete change in practice which makes them obsolete. The cut track spike unquestionably comes under this classification. There is little likelihood that any new development will seriously affect the considerations of design. The only possible reason for a material change arises from an increase in size with the enlargement of the rail as the density and weight of traffic increases. The only radical change which may be expected is its absolute replacement by the screw spike. In view of these considerations the diversity of design in cut track spikes, as pointed out in an article on another page of this issue, is rather difficult to understand. Surely this is a case where standardization is not only feasible but highly desirable, and its fulfillment will result in material economy to both the railways and the manufacturers.

More Labor Saving Equipment

A legislative act of special interest to those in charge of railway maintenance of way work is that providing for a literacy test for immigrants, which was passed over the President's veto by the National House of Representatives on February 1 and by the Senate on February 5, thus becoming a law. In brief, it provides that, with minor exceptions, no alien over 16 years of age shall be admitted who is unable to read 30 or 40 words selected by the immigration inspector in the language chosen by the immigrant. This law becomes effective on May 1 and applies not only to those coming to this country for the first time, but also to those who, although formerly residents of this country, shall have been absent for six months or more, a provision which makes the law apply to the large numbers of men who were called back to their native lands early in the war. The railways are among the largest employers of those classes of immigrants who will hereafter largely be ex-

cluded, while those who are able to pass this test will generally enter the skilled trades. This law will, therefore, tend largely to continue the shortage of labor which has been so acute during the past few months. Thus a condition which has been considered more or less temporary, promises to become permanent at least for several years. The only recourse for the railways is to rearrange their work so as to reduce the number of men which they require. This can be accomplished most directly by the more general adopting of labor-saving equipment. Largely because of the ease with which the necessary number of men have been secured in past years, the maintenance of way department has lagged in the adoption of equipment to replace men and, this substitution has proceeded very slowly. A study of the methods commonly employed will show that there has been an extravagant use of men, and this condition has tended to discourage the development of labor-saving appliances for this field. Now these conditions have suddenly changed. The severe shortage of men last year and the large amount of work left undone at the end of the season demonstrated the need for such equipment. The prospects for an even smaller supply of men this summer when a materially increased amount of work is to be done is now giving added importance to this subject. As an indication of the manner in which a number of the more progressive roads are awakening to this fact, the maintenance officers on one road have already asked for authority to purchase over $500,000 worth of labor-saving equipment this spring, and other roads are considering similar purchases. If this present shortage of labor leads to the more general substitution of mechanical appliances for men, it will not only have had the beneficial effect of conserving men for those duties for which they cannot be so readily replaced, but it will also undoubtedly lead to material reductions in the cost of much of this work.

CONTEST ON APPLIANCE EXHIBIT

THE annual exhibit of the National Railway Appliances Association, which will be held at the Coliseum in Chicago in March, during the stated meeting of the Railway Signal Association and the annual convention of the American Railway Engineering Association, has become an established institution. Many railway men who are not members of either of the associations visit this exhibit each year, as a means of keeping in touch with the latest developments in devices and materials used in their work. The visit to the exhibit, participated in by a large number of men, when taking into account the loss of time, represents a material outlay by the railroads of this country, which can be justified only if the men make the most of the opportunities afforded them.

Some officers of the maintenance department, when granting leaves of absence to assistants to visit this exhibit, require the visitors to prepare and present written reports on what they saw and learned. This not only insures a thorough and serious study of the exhibit by the man who visits it, but also provides a compilation of facts and data that will be valuable reading for the man who could not go.

Believing that a general application of this practice will be instrumental in encouraging a more systematic and thorough study of this highly educational exhibit, the *Railway Maintenance Engineer* and the Railway Age Gazette, published by the same company, have united in conducting a competition for descriptions of the exhibits of devices and materials used in maintenance of way and structures. Anyone employed in railway service is eligible to enter this contest. Writers should study the exhibit so that they can discuss its practical value to railway men and make suggestions by which the displays may be improved. Papers may be of any length, not exceeding 2,500 words. The discussions should be in a form that will permit of reference to the materials and devices by classes rather than by firm names, the latter being used only when absolutely necessary to make the meaning clear.

Three prizes will be awarded, a first prize of $50, a second prize of $25 and a third prize of $10. The awards are to be made by a board consisting of A. S. Baldwin, chief engineer, Illinois Central; C. F. W. Felt, chief engineer of the Atchison, Topeka & Santa Fe, and W. H. Penfield, assistant to the vice-president, Chicago, Milwaukee & St. Paul.

A similar contest covering the exhibit of signal devices is being conducted jointly by the Railway Signal Engineer and the Railway Age Gazette. In order to encourage railway men to make a study of the exhibit as a whole, the *Railway Maintenance Engineer* joins these two journals in offering a single prize of $60 for the best paper covering the entire exhibit, with the understanding that no individual will be awarded more than one prize. Any paper covering both the signal and maintenance exhibits will be considered for this combination prize, but those that fail to win it will still be eligible for consideration in the two main divisons of the contest. If an author does not specify in which contest his paper is to be entered, it will be placed in the group in which it is best suited in the judgment of the editors. The award of this prize will be determined by a board consisting of W. B. Storey, vice-president of the Atchison, Topeka & Santa Fe; A. S. Baldwin, chief engineer of the Illinois Central, and J. A. Peabody, signal engineer, Chicago & North Western, who will serve also as chairman of a board of three judges in the contest on the signal exhibit. Papers entered in any of these contests should be mailed to the editor of the *Railway Maintenance Engineer*, 608 South Dearborn street, Chicago, not later than April 9, 1917.

CONSERVING LABOR

BECAUSE of the very unusual conditions existing in the labor market at the present time, we are devoting more than the usual amount of space to discussions of that subject in this issue. The problem confronting the maintenance of way department this year is not that of securing funds to carry on the work desired, nor primarily that of getting the materials required, even though deliveries are delayed badly, but that of securing a sufficient number of men to do the work authorized. Therefore, the energies of maintenance officers should be directed primarily towards the means of recruiting and conserving the forces at hand. Already a number of northern roads have agents in the South endeavoring to organize and ship north gangs of negroes, guaranteeing them high wages, employment for the full season and transportation home in the fall. Similar measures are being used to attract Mexicans east, one prominent eastern road offering Mexican laborers transportation for themselves and families over 1,500 miles east from El Paso, $1.90 per day and return transportation after six months. It is estimated that it is costing this road over $40 for each man delivered on its lines.

Such conditions naturally lead to general increases in wages, one road bidding against another, so that the entire labor market soon becomes demoralized. Already a wage of $2 for a 10-hour day is being generally paid, and $2.50 is not uncommon. As the season advances it is probable that the competition for men will break all records. The direct result of such conditions is the utter

demoralization of the forces and an actual decrease in the amount of work secured from the men.

The bidding of one road against another for men in this way will accomplish nothing. Under present conditions the roads cannot compete with the factories in the matter of wages and increasing the rate of pay either directly in the hourly rate or by allowing extra time, creates only a temporary advantage, for while a road may gain a few men temporarily from another line by such a move, it will soon lose them to another road which adopts the same practice. Increasing the wage rate for track laborers does not increase the total number of men available under present conditions and the roads will be ahead in money and also in the amount of work secured by realizing this condition and refraining from engaging in a mad scramble for men in this way.

A more reasonable means of getting the maximum amount of work done is to start at the earliest possible date in the spring. This will require the careful planning of the season's work, to permit as much of it as possible to be undertaken as soon as the frost leaves the ground. It is self-evident that, with a given supply of labor, the amount of work performed varies directly with the length of the working season. Even though the competition for men will be keen early in the spring, it will undoubtedly increase in severity as the season advances, and the road which gets an early start will be ahead by that amount.

After securing the men it is to the interest of each road to endeavor to hold them in the service. With many men employed in this kind of work, the wages paid is not the only consideration, but good living and working conditions are also an important factor. For this reason close attention should be paid to the condition of the camps and to the character of the food served. Already a number of roads have given the problem of camp equipment careful attention and on these lines the old style of box cars, condemned for revenue service, has been very generally replaced with better cars or with portable camps with more comfortable accessories. While it is not expected that it will be possible to eliminate all complaints regarding food or quarters, money spent for the improvement of these facilities will yield large returns this year.

MAKING CONCRETE TOO WET

REPEATED references during the recent convention of the American Concrete Institute to the injurious consequences attending the use of an excess of water in the mixing of concrete, and the note of caution covering this practice in the final report of the Joint Committee of Concrete and Reinforced Concrete, are indicative of the growing realization of the dangers of this practice. This matter has received a limited amount of consideration in certain quarters for several years, but it is only within the last year or two that the subject has been given general attention.

The history of practice and opinion as to the amount of water to be used in mixing concrete is interesting. Previous to 1900, concrete was put into place so nearly dry that practically every specification contained the words, "the concrete shall be thoroughly rammed into place." However, in the course of the enormous amount of investigation carried on shortly after that date, it became apparent that the greatest strength of concrete could not be obtained without the use of a larger proportion of water. These findings, becoming current during the very time that the use of reinforced concrete was receiving its first general impetus in this country, when constructors were experiencing great difficulty in placing the nearly dry concrete around intricate networks of bars, were received with enthusiasm on the part of the builders, and by 1905 most specifications called for "a concrete of a quaking consistency."

At the time this change became effective hand mixing was the rule and the shovel was the universal tool for both mixing and placing. In consequence, there was a definite check on the consistency of the concrete in that it had to be stiff enough to be picked up readily on a shovel. The years since that time have witnessed the remarkable development in methods and equipment for mixing, transporting and placing concrete. Speed, economy and fewer laborers has been the slogan of the concrete constructors. The laborer with his shovel has been replaced by elevating loaders, mixers, spouts, bottom dump buckets and dump cars. The rapid and efficient handling of the newly-mixed concrete with these various equipments demands a concrete of the greatest possible fluidity. This has exerted one beneficial influence in that it introduced a check on the thoroughness of the mixing, for other things being equal, the concrete which is most thoroughly mixed will flow the best. On the other hand, there has been also every encouragement to use the largest amount of water possible.

A number of evils attend the excessive use of water, among which the most important is the decreased density of the finished concrete. Water occupies space, and after it has evaporated this space constitutes voids in the concrete. An excess of water tends also to produce a separation of the materials at the time that they are being placed in the forms, the coarser aggregates remaining in a heap near the point where the concrete was deposited, while the finer material flows to more remote parts of the forms. An excess of laitance or scum forms the top of each day's run, which, unless carefully removed before starting the next day's work, will produce definite cleavage planes, which are made evident on the surface by unsightly streaks or seams. With the presence of any appreciable amount of loam or clay in the aggregates there is danger of the segregation of this foreign matter in thick layers, which are a source of actual danger.

It is encouraging to note that these facts are coming to be appreciated by the users of concrete, but it will take time to put remedial measures into definite practice. It is difficult to specify or even to describe a proper consistency at present. In general, a concrete on which water stands after it has been placed in the forms is too wet. However, objections may be raised to this, or almost any other qualifying term that can be suggested. Until this problem is solved, it behooves those responsible for concrete construction to watch this matter closely and guard against the use of excessive water by whatever means suggest themselves.

NEW BOOKS

Steel Railway Bridges. By Edward C. Dilworth, designing and contracting engineer, Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa. 185 pages, 12½ in. by 9½ in., illustrated. Bound in cloth. Published by D. Van Nostrand Company, New York. Price, $4.

In the preface the author states that "it is the intention of this volume to supply practical data for the design and weight of steel for railway bridges." This aim is carried out consistently throughout the volume. One hundred and nine pages are devoted to plates containing weights, curves and general plans for girder and truss railway bridges, viaducts, swing spans and turn tables. The last ten pages give moment and shear tables. In the first third of the book 54 pages are devoted to a discussion of practical considerations that have to do with the design and detailing of steel structures. The book implies a thorough knowledge of structural mechanics

and bridge design and is consistent in not entering into any theoretical treatment. On the other hand, many explanations are accompanied by formula worked out with numerical examples. The specifications of the American Railway Engineering Association for steel railway bridges occupy 11 pages. The typography, sketches and plates deserve special commendation.

Proceedings of the Railway Storekeepers' Association. 212 pages, 6 in. by 9 in. Bound in cloth. Published by the Railway Storekeepers' Association, Box C, Collinwood, Ohio. Price $3.

This volume contains the report of the thirteenth annual meeting of the Railway Storekeepers' Association at Detroit, Mich. It includes reports of committees and discussions of the various assigned subjects of vital importance in the administration of railway stores. Subjects covered that are of particular interest to maintenance men appears under the report on standard buildings and structures, scrap and scrap classifications, reclamation and lumber. Valuable information is found under the last named head on economical ordering, on sorting, and selection of grades and on the reclamation of lumber by resawing.

Pipe and the Public Welfare. By R. C. McWane. 165 pages, illustrated, 7½ in. by 5 in. Bound in cloth. Published by the Sterling Press, 318 Thirty-ninth street, New York. Price $1.

This book may be divided into three sections, viz.: historical notes, a treatise on manufacture and a discussion of durability. The historical section touches on the long life of cast iron as evidenced by specimens of ancient origin still in existence. It also reviews briefly the history of the water supplies of London, Philadelphia, New York and Boston and gives some notes on water supply development in Rome and the earliest installations of cast iron pipe in the vicinity of Paris. The section on manufacture outlines the methods used in the production of cast iron, wrought iron and steel pipes. The discussion of the life of pipe occupies the larger portion of the book and includes an exposition of the author's theory for the greater life of cast iron as compared with wrought iron or steel. Actual figures from the records of a great many installations of these three kinds of pipe are also given. The last chapter is devoted to wood pipe and contains some historic data on the old bored log pipe, but deals chiefly with the service secured from the more recent wood stave pipe.

Winter Track Work. By E. R. Lewis, assistant to general manager, Duluth, South Shore & Atlantic, Duluth, Minn. 148 pages, 21 illustrations, 5½ in. by 8 in. Bound in cloth. Published by the Railway Educational Press, Chicago, Ill. Price $1.60.

The author of this book has been in charge of the maintenance of track on railways in the northern part of the United States for a number of years, first as division engineer on the lines of Michigan Central in northern Michigan and more recently as assistant to the general manager of the Duluth, South Shore & Atlantic. He is, therefore, thoroughly conversant with the problems of fighting snow and ice. The book is prepared from the standpoint of the track man confronted with the problem of keeping the line open during the winter when snow and ice are a continual source of trouble. The book opens with a chapter on the effect of climatic conditions on track maintenance. Two chapters are then devoted to frost and its effect in heaving and to the application of shims to maintain the track surface. The problems presented by snow and the precautions which the maintenance forces can and should take to minimize its effect, the removal of snow in terminals, the location and purpose of snow fences and sheds and the operation of plows and other snow-fighting equipment are discussed in considerable detail. One chapter is devoted to a discussion of the size and organization of the winter track force, the tools necessary and the work which can be done at this season. Chapters are also devoted to methods of storing ice and to spring floods. The book closes with a chapter on railway organization which contains valuable suggestions regarding the essentials of organization and methods which will assist one in advancing from the lower to the higher positions. This book has been prepared in a practical manner and will be of value to all track men confronted with the problems of fighting snow and ice during the winter. For that reason its appearance at the present time is particularly timely.

Practical Track Maintenance. By Kenneth L. Van Auken, vice-president the Railway Educational Press, Chicago. 294 pages, illustrated, 5½ in. by 8 in. Bound in cloth. Published by the Railway Educational Press, Chicago. Price $1.60.

This book deals with those problems most commonly confronting the roadmaster and the track foremen in the conduct of their work. It is written from the standpoint of these men by one who has worked as a laborer and as a foreman and who knows the practical phases of their problems. The book opens very appropriately with three chapters entitled The Big Problem—Labor, Developing Track Foremen, and How to Handle Laborers. Other chapters are entitled Renewing Ties, Relaying Rail, Ballasting and Surfacing, Reports and Accounts, Spring Work, Summer Work, Fall Work, Winter Work, Track Work in the Tropics, Yard Maintenance, Rapid Improvement of a Section and Track Materials, Tools and Appliances. An appendix contains descriptions of a number of types of equipment used in routine maintenance of way work. It also contains 13 tables of use to a foreman, including those for temperature expansion for laying rails, middle ordinates on curves, sets of switch ties for various turnouts, etc. This book deserves careful reading by even the most experienced roadmaster, and it will be found of much assistance and value to a foreman in bringing new ideas and methods to his attention.

Proceedings of the American Society for Testing Materials. Edited by Edgar Marburg, secretary-treasurer, University of Pennsylvania, Philadelphia, Pa. Two volumes. Illustrated, 6 in. by 9 in., Part 1, 614 pages; Part 2, 502 pages. Bound in paper, cloth and half leather. Published by the society, Philadelphia, Pa. Price per volume, paper, $5; cloth, $5.50; half leather, $6.

These volumes contain the proceedings of the 19th annual meeting held at Atlantic City, N. J., June 27 to 30, 1916. The first book contains the reports of the committees and tentative standards. Among the reports of particular interest to railway men are those on preservative coatings for structural materials, the preparation of iron and steel surfaces for painting, methods of laboratory sampling and analysis of coal and proposed revisions in tentative methods for sampling and analysis of creosote oil. The tentative standards are printed in the proceedings for one or two years for the purpose of eliciting criticism which the committee will consider before recommending final action tending towards the adoption of these standards. Among these tentative standards are specifications for cut and screw track spikes, tie plates, copper plates for locomotive fire boxes and copper bars for locomotive stay bolts, Douglas fir bridge and trestle timber and yellow pine timbers to be creosoted.

The second volume consists of technical papers presented before the association, among which are a number of special interest to those in railway service. Included among the papers of this class are those on Heat Treatment of Carbon Steel Locomotive Axles; Water Versus Oil Quenching, by C. D. Young, and A New Form of Specifications for Concrete Aggregates, by Cloyd M. Chapman.

MEXICANS AS TRACK LABORERS

The Characteristics of the Peon and the Conditions Under Which He Is Hired and Employed on Railroads

THE Mexican peon has been for many years the standard track laborer on the American railways along the Mexican border and in later years his usefulness has extended northeast on the roads which had formerly employed him only along the border. The unprecedented scarcity of track labor during 1916 led to strenuous efforts to secure men from every available source, with the result that the Mexican was found on tracks as far east as Pennsylvania.

The Mexican is a hybrid, of Spanish and Indian extraction, the latter frequently predominating. In consequence he has traits and habits differing materially from the other types commonly found in track gangs. To secure the greatest good from any laborer one must understand him, and as the Mexican will undoubtedly be employed this coming season by many who have never encountered him before, an account of his characteristics will be of material assistance. The following articles, written by men who have had years of experience with the peon, cover various phases of his character and habits, the available supply of these men, the methods of employment and the living conditions to which he is accustomed.

USING THE PEON ON TRACK

By F. L. Guy

Resident Engineer, E. P. & S. W., Douglas, Ariz.

Mexicans, as a rule, like to work in large gangs, or in the larger towns, and it is often easy to get them for extra gang service when laborers for section work are very scarce. Mexicans with families are preferred to the single men, as the latter will not stay and work as well. It has been the practice to pay about 25 cents per day more for extra gang work than for section work, but as an experiment about two years ago the same rate was paid for each class of work and it was found that the extra gangs could be maintained at a maximum while men from the sections would go to the extra gangs. As a result 25 cents per day is now saved for all men in the large gangs, and the class of labor is just as good.

There is always a great deal of typhus fever in Mexico and it is now necessary for all who enter the United States to be examined by a physician at the border, and to present the health authorities on this side with a health certificate, and a certificate to the effect that the individual has had a "gasoline" bath. Typhus fever can only be spread by body lice and the "gasoline" bath kills them. The railroads along the border require all newcomers in their camps to bathe with a mixture of kerosene and common vinegar, mixed half and half. This rule applies to men, women and children, and additional treatments are required whenever lice are discovered subsequently. As a result, typhus fever is comparatively rare, even along the border, where one would expect it to be more prevalent.

The Mexican peons are not a cleanly people, but still there is not as much sickness among them as one would think. They have no fear of smallpox and seem to want their children to get this disease while young. Whenever one of them gets smallpox he will hide away and it is very difficult to prevent the spread of the disease.

On account of their method of living, the bunk houses furnished them should be so constructed that they may be easily cleaned, disinfected and fumigated. In the Southwest floors in the bunk houses are not necessary, but in the North and East, where it is damp and cold in the winter time, they should be provided. The houses should have rooms about 12 by 16 ft., and in these rooms one and sometimes two families will live, or from six to eight single men. The railroad provides rough wooden bunks and the occupants furnish their own bedding. Mexicans as a rule are very kind to each other and they will divide their food and their bedding, or whatever they may have.

For food they use a great deal of coffee, flour, beans and potatoes and if they can get these they seem to be satisfied. The peon is very much like a child. He likes brightly-colored things and will spend his last cent to get some trivial ornament. He has no thought of the morrow and little does he care as long as his wants for the present are satisfied.

In the matter of transportation, railroads close to the border issue return passes to El Paso after three months' continuous service. Railroads more remote give return transportation after six months' continuous service. If transportation is promised them, it ought to be furnished. A railroad which does not live up to its promises will have a hard time getting more gangs. As a rule, the men are paid once a month, and this seems sufficient. In most cases they work better when they are entirely without food or money. Whenever they get a dollar or two ahead they seem to want to go somewhere else.

Mexicans can be taught to do good track work. But the responsibility is always with the foreman. He must show them by example how to tamp ties, put on tie plates, drive spikes, tighten bolts and dress the track. And under no circumstances should he send them out alone, for although they may know how to do the work, they will not do it without close supervision. When they are tamping ties the foreman must watch them to see that the ballast is packed solidly under the ties, and that no void is left there. When they are tightening bolts, the foreman must see that the bolts are really tight for a Mexican will pretend to use great strength where a bolt may be actually turned by hand. So in handling this class of labor, the foreman must not forget that by nature the Mexican is a child, and that patience and kindness with firmness and constant supervision are the requisites by which to secure satisfactory results.

HOW MEXICANS ARE EMPLOYED

By W. R. Groshell

Roadmaster, A., T. & S. F., Fresno, Cal.

The supply of Mexican labor though limited at present by war and by United States government restrictions, on account of the typhus scare, will again be plentiful when normal conditions prevail. It has been necessary ever since the importing of labor by contract was prohibited to hire the men after they crossed the border

for the purpose of obtaining employment. The method most generally adopted is to contract the entire supply of laborers needed on the railroad to a labor agency, usually with headquarters at El Paso. The laborers are shipped where needed, furnishing them with transportation and meals en route, the meals being charged later to their account.

When the division point to which they are assigned is reached, they are fitted out with food supplies and cooking utensils and forwarded to the section or extra gangs. At their destination they are placed in bunk houses, consisting of one or two room houses, built in a connected row, each fitted up with cook stove and bunks. In this connection it may be stated that in general the better the quarters furnished the longer the men will stay. It has been the prevailing notion that any old place is good enough. But this is not borne out by experience. Even though he be a poor Mexican and never had any comfortable quarters he is very grateful for any comfort given him, and cases can be cited where Mexican laborers have staid in the same place and on the same section for several years at a time.

When arriving on the job he is fatigued by long travel after having suffered previous privations and an insufficiency of food. For a week or two he will seem a poor laborer, but if given a chance to gain strength he will soon pick up. If the man is allowed to gain strength and is taught his work with patience (Mexicans are slow to learn) he will become an efficient and loyal employee. A Mexican is slow in taking the initiative. When his task is finished, he will wait for the foreman to direct him to other work. It is very desirable, yes, even necessary, for foremen to learn the Mexican lingo, or at least acquire enough knowledge of the terms and phrases most needed in connection with the work to enable him to get the work done more quickly and satisfactorily, as Mexicans are slow in adopting American ways and language.

In floating gangs, steel gangs and large yards much benefit has been gained by picking out the best men, paying them 25 cents per day extra and putting them in charge of a few men doing odd jobs, such as cleaning or finishing up, picking up and distributing material, etc. In this way good sub-foremen have been secured although, because of a lack of initiative, they have not proved successful as regular foremen, being handicapped also by insufficient education and slowness in mastering English.

Any railroad that can obtain its fully supply of Mexican laborers is fortunate, as I cannot think of any other class of labor that will stand in the blistering sun for ten solid hours, day after day, without complaint and swing a tamping pick for the small wage they receive. They will work at wrecks in blistering sun and blizzard and washouts in water and mud up to their necks and never shrink from dangerous places, if the foreman will lead the way. They will carry out to the letter any instructions if properly understood, and are faithful and loyal to their superiors if well treated.

Of all his bad habits, that of love for liquor is the worst. Very little is sufficient to have him under its influence and once intoxicated he will become quarrelsome and invariably get into a fray with one of his countrymen. Another undesirable habit is his desire to lay off. The average Mexican wants to lay off at least one day in a week and sometimes two, particularly after pay days. They have many religious holidays, which, taken all together, will interfere with the plans for the work, but with a foreman of good judgment and firmness, there is no trouble to get them to work steady enough, though it is advisable to let them have a day off during their religious or patriotic holidays, such as May 5, September 16 or December 6.

It pays to show good grace on such occasions, and an everlasting gratitude may be secured by a show of respect or by furnishing them with some flowers for the occasion. It is not necessary or desirable to mix with them. It is far better to treat them just, but firmly. On the contrary, if the foreman becomes impatient or, worse, abusive, he will get less and poorer work and he will be unable to hold his men. Once having the reputation of being a "bad man" he will always find himself short handed.

The Mexican is very patriotic and loves his mother country, in spite of the wretched conditions prevailing in that unhappy land. Hence he labors under a constant desire to revisit his native land. Therefore, a Mexican laborer is commonly given free transportation for himself and his family to El Paso, after 6 months' service, a privilege of which he often avails himself, frequently returning to the same section or gang, if he feels attached to the foreman and in many cases bringing a friend or relative whom he wants to place.

Every man who has not a family is his own cook, although two or three may co-operate in preparing meals. Generally the agency which hires them supplies all their needs, all sales being turned in in the shape of board bills, and the amounts being deducted from the pay checks. This method has been found much more satisfactory to all concerned after different schemes of boarding them proved dismal failures.

The married man is to be preferred, as he works the steadiest and stays longer on the job, though not always the most efficient laborer. Not all Mexican laborers are good. Very often a poor man depends on a good man, who may be his friend or relative, to hold the place for him.

In the same class with the Mexican is to be placed the Yaqui Indian, who is fully as competent and efficient, or more so, being of a more quiet disposition. Taking it altogether, the Mexican, with all his faults, is equal to the best and superior to many of the laborers of nationalities which are classed as cheap labor.

HOW TO HANDLE MEXICANS

By James P. Craig

General Foreman, Material Yards, A. T. & S. F., National City, Cal.

[The following article, abstracted from the Santa Fe Employees Magazine for November, 1914, brings out a number of points not covered by the other writers, and is therefore printed in this series.—Editor.]

In handling Mexicans the first and most important thing is to establish a reputation as a man of your word. Moral courage is important, for the reason that the average Mexican has a superabundance of physical but very little moral courage. They invariably travel in pairs, trios or groups, consisting of relatives, neighbors or *compadres*. The boss generally will find that it pays to keep track of these groups, as any trouble with one is likely to be followed by demonstrations from his friends.

You never will be able to control your men until you first can control yourself absolutely at all times. If a Mexican can see that he is succeeding in worrying or aggravating you he will in many cases do his best to make your life a burden. Many a good man has been worried off the job in just that way.

A knowledge of the Spanish language, or at least enough of it to be able to explain work, carry on a common conversation and tell what the men are talking about, is absolutely essential in your efforts to avoid

friction. If you don't understand Spanish they pass their time ridiculing you to your face. You never will get the best results through a head man or an interpreter.

The average Mexican is slow of comprehension and it requires a great deal of explanation for him to grasp an idea. After he gets it he holds it fairly well. He would rather listen to the boss explain than to work. If you are not on the alert he will take advantage of you by pretending he does not understand. If you will let him, he will lead you into an argument simply to take your attention from the work in hand. They are past masters in dodging work, and will tax the ability of anyone who tries to keep them at their tasks. On the other hand, when they become convinced that you are up to all their tricks, they will work very well, provided you treat them justly.

Constant reiteration of rules and orders is absolutely necessary in handling Mexicans. Like children, they soon forget. When properly handled they are willing to do a great deal for a man, often working for ridiculously low wages or giving the very best of service for common wages.

To get the best results be an absolutely impartial judge. Reward by kind words and good treatment all men who try to do what is asked of them. Be patient and never reproach a man until it is a certainty that he is at fault. Never reproach a Mexican severely in the presence of others. The Mexicans are sensitive people and cannot stand being humiliated continually in the presence of their fellow workmen.

Most Mexicans cannot read or write. Consequently they pass a great deal of their time, when in bunk cars, talking about the different places at which they have worked. Any section or extra gang boss who is either very good or very hard on his men is known all over the system through this "clearing house." Often men cannot choose their employer, but in the end the capable foreman gets the good men and the unjust one gets nothing but the chaff.

Mexicans often will leave a job for fear of some other Mexicans. Possibly you have some would-be bad man who is running them off. Pride will keep them from confessing the true reason, and they will always give a false instead of a true reason for everything. Secretiveness is a national trait and they are very clever about hiding their motives. They more often quit because of some wrong, real or imaginary, than on account of the wages they are receiving. Even though they often say they are leaving on account of poor wages, Mexicans are not affected half as much by wages as by treatment.

Many Mexicans, after working several months in one place, become restless and want to move. Instead of quitting outright, they ask for more money and commence to "lay down" on the job and get impudent. In these cases there is only one thing to do and that is quietly let them out. They may come back penitently in a week or so and become good workers. Do not hesitate to take a man back if you are convinced that he is penitent and that he intends to reform.

The best laborers are generally those who are most anxious to get money. For that very reason the best men are often heavy drinkers and gamblers. Mexicans can live on very little and many would prefer to work half time and live on short ration rather than eat and dress well and work steady to do so. These are the kind of hands to let work for the other fellow.

Mondays and Saturdays are never as good workdays as the other week days; also the day following a holiday is poor. Payday is a blow to labor from which it requires from three to five days to recover. When men want to stop work temporarily let them off if you can, but do not allow this to become a regular thing.

Mexicans are strong in their likes and dislikes. If they like a new man they will help him and tell him about his work. But if they are not well impressed with the newcomer they let him strictly alone. They will not warn him if they see him in danger, nor will they aid him if he performs his work incorrectly. The Mexican peon is the originator of the now famous phrase, "I should worry."

Certain diseases are very common among Mexican laborers. They do not take proper care of themselves. After waiting a long time before going to a physician, they finally patronize a quack. I venture to say that over 50 per cent of the Mexican laborers have been permanently affected by these diseases. It would pay employers to make some arrangement whereby all such cases would immediately be taken care of for a small fee.

The Mexicans are born and raised under the padrone system. They must have someone in whom they have confidence to go to for advice. It will pay any man to act as a padrone to his Mexicans. Therefore, always try to avoid the appearance of bossing.

In working a gang of Mexicans personally allow them to talk and jest as long as it doesn't interfere with their work. Never stand very close to them unless one of them is "soldiering." In that case stand alongside the guilty one rather than call him down. If they work diligently stand farther away. At all times endeavor to keep your voice low and pleasant. Speak sharply only on rare occasions; then, when you do, your words will have the desired effect. Another thing: Set a good example. If the boss relaxes, sits down or leans up against something to rest, the men ease up in their work.

THE SUPPLY OF MEXICANS

By M. P. Hayes
General Manager, Holmes Supply Company,
Los Angeles, Cal.

The principal source of supply for Mexican labor in this country is El Paso, Tex., where labor agencies are located which handle all the details in connection with the listing of names of laborers and their families who have been passed by the United States Immigration Bureau, making the various reports called for by the federal and state authorities, insuring a compliance on the part of the immigrants with the El Paso health ordinances, feeding, lodging and attending to transportation and conducting them to the place of their employment, in accordance with the labor requisitions from the various railway officers.

As a rule, the average Mexican laborer and family are satisfied with the most primitive arrangements so far as comfort goes; comfort seems to be a remote consideration with him as compared with kindness and fair treatment. He makes no demand for conveniences, facilities, or arrangements for his well-being, accepting a box car with wooden bunks and no windows with the same readiness that he would a modern bunk car, or a new section house fitted up with the latest pattern in steel bunks. Apparently the newcomer finds very little in the working conditions in this country, even when they are undeniably bad, which are not superior to the conditions from which he escaped when he left his home. He accepts what you offer him in the way of accommodation without finding fault, remaining as long as it pleases him to do so, and will leave good, comfortable quarters to work with or near some remote relative or friend.

For the foreman who understands him, speaks his language and has his good will, he will be found not only a

willing but faithful worker; under an indifferent foreman his indifference will exceed the foreman's—if that be possible. He is dirty according to the standards of other classes of laborers, but only in a different way, and in this respect has the advantage of desiring to be clean, and will keep so if given very little encouragement.

Speaking for the port of El Paso, from which is drawn the Mexican labor for the entire Santa Fe System (except the Texas lines), the Southern Pacific, the Texas & Pacific, the Rock Island and the El Paso & Southwestern, and practically all of the public utility corporations and mines of New Mexico, Arizona and California, there has never been a time in the past ten years, except during the winter, when the labor supply came anywhere near meeting the demand. From incomplete records, it is estimated that an average of 50,000 laborers a year have been forwarded from that point during the past five years and that from April to September of each year the demand would absorb not less than an additional ten thousand. This, however, does not mean that any such number were regularly admitted through the immigration office, since many of the laborers are simply returned to work after having completed the term of service necessary to obtain free transportation back to El Paso.

As a general thing, the men are offered fuel, water and house rent free, with wages which have varied from $1 to $2 a day. They are also promised commissary supplies at reasonable prices and free transportation back to El Paso after working steadily on the road for periods ranging from six months in some cases to a year in others.

Having outlined in a general way the conditions with respect to the Mexican laborer, it might be well to add that the conditions to-day are such as materially to reduce the value of any records of past conditions which may have been compiled. The state of anarchy which obtains in Mexico, with its consequent abandonment of train service makes it practically impossible for the laborer to reach the border. Ordinarily a walk of two hundred or three hundred miles has no terror for the average *paisano*, but the uncertainty of the supply of food on his journey and the probability that he will be forced to join one of the many cut-throat bands which infest the country, to say nothing of the ordeal of disinfection and possible quarantine when he reaches the border, are all dangers of no less proportions than those he has been facing and tend to discourage any thoughts of leaving home.

The Concrete Institute Convention

THE annual convention of the American Concrete Institute took place in Chicago, February 8 to 10, inclusive, or simultaneous with the first days of the Chicago Cement Show, which was held February 7 to 15, inclusive. The convention was well attended and a large amount of valuable information was presented in papers and committee reports. Notes on three subjects presented which are of interest to railway maintenance men appear below.

The cement show, which was the tenth to be given in Chicago, occupied the Coliseum, and 175 firms exhibited. The show conformed with the policy and general plan followed in more recent years by the organization in charge of this exhibit by catering directly to the concrete constructor and his needs. While demonstrating a healthy development in the concrete industry, the tendency toward standardization was the prevailing note of the show, and was marked by an almost entire absence of freak ideas. This was to be noted particularly in the common exhibit of the National Association of Mixer Manufacturers. Another feature of the show which was of particular interest was the joint educational exhibit of the Portland Cement Association, designed to illustrate the possibilities of the field and give object lessons in the production of good concrete.

Concrete Piles

Charles R. Gow, consulting engineer, Boston, Mass., gave a lantern slide talk on concrete piles, plain and reinforced. He covered the subject of cast and drive piles, describing the usual form and also those intended for special purposes. This included piles designed to withstand exceptionally difficult driving conditions and those arranged to facilitate jetting. A special type was shown in which the pile is driven by means of a jacket so that the effect of the hammer is applied directly to the base of the pile and does not in any way effect the shaft.

Under methods of manufacture special emphasis was placed on the need of an unyielding foundation for casting the piles to insure that they will not be injured by settlement of the forms. The longitudinal reinforcement must be provided to withstand the stresses caused by lifting them preparatory to driving, but these stresses may be reduced materially by the use of special bridle rigs for lifting them. This was illustrated for a number of cases, including the longest concrete pile ever made, 106 ft.

Driving caps were also illustrated, showing the method of using cushions of wood blocks, coiled ropes, sawdust and pieces of hose. The cast iron caps were recommended over those made of structural steel since the latter show a tendency to loosen up at the riveted joints during driving. A method of driving sheet piles by churning was also shown; that is, working the piles up and down by utilizing the effect of their own weight without the assistance of a hammer.

In comparing the precast piles with those built in place, the former were recommended as being the safest, but with the disadvantage that it is necessary to wait thirty days after the piles are made before they can be driven, whereas most building owners are unwilling to undergo a delay of this kind after having let a contract for a structure.

The second portion of this paper covered the various types of built-in-place piles. This included the Raymond pile, consisting of a sheet metal shell, driven by a mandrel, which is filled with concrete after the mandrel has been withdrawn. These piles have been in use since 1903. The Simplex pile was also described, which consists of a stiff steel shell driven by a hammer and then withdrawn as the concrete is placed. The developments through which these various types have passed were described in connection with a discussion of the effect of subsequent driving on piles of this type already in place.

Unit Construction

John E. Conzelman, civil engineer, St. Louis, Mo., reviewed the development in the construction of the unit reinforced concrete members in an especially arranged yard or factory to be erected at the site of the structure after having been properly cured. He pointed to the particular advantage of the production of concrete under what he termed factory conditions and cited a long list of classes of structures which had been built according to

this method. This included sea walls, caissons, docks, retaining walls, tunnel linings, culverts, pipes, sewers, fence posts, poles, buildings, bridges, roundhouses, train sheds, etc. In his opinion the railway field offers a material opportunity for development along this line and such structures as engine houses, freight sheds, snow sheds, train sheds and small stations offer special opportunities for the development of unit standards. Savings of 30 to 40 per cent were estimated as possible with the adoption of this type of construction. The paper was illustrated by lantern slides illustrating examples of structures of various kinds, including train sheds of the unit type at Denver, San Francisco and Los Angeles, concrete cribbing on the Rock Island at Chicago and a roundhouse of the Santa Fe at Riverbank, Cal. Attention was also drawn to the fact that, except for the very heavy slabs developed by the railroads themselves for trestle bridges, practically all of the unit construction done so far has been developed by a very small group of firms and individuals.

HYDRATED LIME

Hydrated lime was the subject of considerable discussion, and although a report on the progress of some tests to establish the influence of this material on the strength and other qualities of concrete was withheld, some interesting facts were brought out in discussion relative to the increased plasticity of concrete to be secured with the use of hydrated lime. By adding this to the concrete it may be made to flow in chutes or from buckets or cars much more readily than without this ingredient. This practice was said to do away with the common tendency to use an excess of water. One speaker stated that there was no question but that concrete of maximum density and imperviousness can be secured through proper proportioning, grading, mixing and placing without the addition of any other ingredients than the cement, aggregates and water. He called attention, however, to the fact that the requirements to secure these results were difficult to realize under field conditions and that the use of hydrated lime materially reduced the difficulties encountered.

Attention was also called to the fact that contractors have purchased hydrated lime at their own expense when not required by the specifications for the work, because of the savings to be secured in labor, lower grades for the chutes and the general ease with which the concrete could be handled.

Variations in Track Spike Design

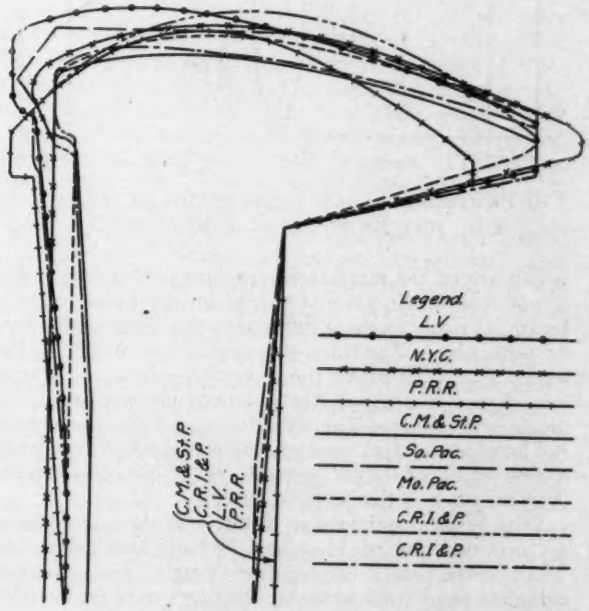
THE common track spike has been used in its present form for a great many years. It is a simple device and its requirements are well known and have been discussed frequently. In view of this, it is difficult to explain why orders for spikes from 6 different railroads which were being made under the supervision of a single mill inspector covered 12 designs of spikes, no two of which were alike.

The considerations affecting the design of a track spike are so few in number and so simple that it would seem entirely feasible to devise a standard design. These requirements may be enumerated briefly as follows: the holding power, as determined by the shape and overhang of the head; the strength to resist lateral and vertical motion of the rail and the stresses of driving and pulling, as determined by the cross section of the shank and the size and shape of the head; adequate bearing of the spike against the edge of the rail base, as accomplished by reinforcing the shank at its connection with the head either on the front or the back; the damage it does to the tie, as influenced by the shape of the point; and the convenience with which it may be handled, either in driving or pulling, as determined by the shape of the point and the accuracy with which the head fits the claw bar.

On track subject to brine drippings the ideal spike must fulfill an additional requirement—resistance to corrosion. This has not been accomplished in any actual spike, with the result that spikes are renewed frequently and in some cases the size of the head has been increased on this account. One road east of the Missouri river has found it necessary to renew the spikes three times in the life of the rail on one division carrying a large amount of refrigerator traffic. Rail cutting is another condition imposed for which there is no real remedy. Ample section must be provided to allow for the metal lost by this action and it makes no difference how it is provided, as the metal lost is always that adjacent to the rail.

Obviously the above considerations may be taken into account in a great many different ways. Some American railroads have found that the requirements are fulfilled satisfactorily by the spikes made according to the standard designs of the steel mills. Many other roads, however, have deemed it necessary to obtain spikes made according to special designs.

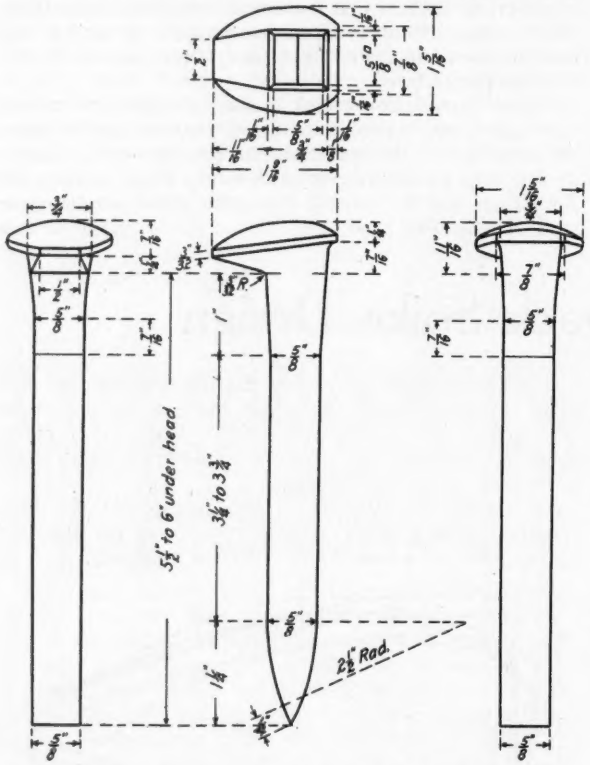
Interesting information in this connection has been obtained from a study of data concerning the standard spikes used on a number of different railroads, most of this information being collected by the track committee of the American Railway Engineering Association. The size of the spikes or the cross section is pretty well standardized, practically all spikes being made either from 5/8-in. or 9/16-in. bars, although a few are made from



CROSS SECTIONS OF EIGHT STANDARD SPIKES

½-in. and ¾-in. bars. In the length of the spike, however, there is considerable variation.

From a total of 63 different spikes 36 were 9/16 in. square in cross section and 35 were ⅝ in. Of the smaller size, 13 were 5½ in. long, 4 were 6 in., 3 were 5¾ in., 2 were 5 13/16 in. and 2 were 6⅛ in. long. There was also one 5⅞ in. and one 6¼ in. long. In the case of the ⅝-in. spikes, 16 were 6 in. long, 5 were 6 1/16 in., 3 were 5¾ in. and 2 were 6½ in. In addition to these, there were one each having a length of 5½ in., 5⅝ in., 5 13/16 in., 5 15/16 in., 6 5/16 in., 6 7/16 in., 6½ in., 6 9/16 in., 6⅝ in. and 7 in. These figures demonstrate an almost entire lack of uniformity except in the case of the 9/16-in. spikes 5½ in. long, most of



THE PROPOSED STANDARD SPIKE OF THE AMERICAN RAILWAY ENGINEERING ASSOCIATION

which are of the manufacturers' standard design. This is not true in the case of the ⅝-in. spikes of the 6-in. length, as many of these differ as to the shape of the head or otherwise. The fact that there are many of that length is explained by the natural tendency to use an even figure where possible and does not necessarily indicate uniformity. The situation as to the ⅝-in. spike is, therefore, a clear case of duplicated efforts to design a new spike of larger size in the transition from the 9/16-in. stock to that 1/16 in. larger.

With respect to the shape of the point there is a greater uniformity. Out of 34 spikes, 29 had chisel points and 5 had Goldie points. In the case of eight spikes of which complete plans were available the edges were symmetrical with the axis of the spike in six. The length of the point does not vary much, being 1⅛ in. on four of the spikes and 1¼ in. on the other four.

The uniformity ends, however, when we come to the head of the spike, as may be seen from the accompanying diagram which shows the outline of the heads of the eight spikes superimposed to the same scale. In all eight designs the shank is reinforced at its connection with the head by increasing the thickness in a direction transverse to the length of the rail. The wedging effect thus obtained is relied upon almost universally to obtain the required bearing of the spike against the rail. However, there is a sharp conflict between the advocates of two distinct methods of accomplishing this. One class believes that this bearing is best obtained by beveling out the spike on the side next to the rail, so that the face of the spike at the top comes closer to the rail as it is driven vertically downward. Others think that it is better accomplished by placing the wedge on the rear of the spike, thus forcing the spike over against the rail during the driving of the last inch or more of its length. There is merit in each contention, and the methods really differ but little. In three of the eight designs, the increase is made on the front; in five on the back. The length of the taper also varies greatly. The ⅝-in. spike proposed as a standard by the track committee of the American Railway Engineering Association is reinforced by a taper of 1/16 in. on both the front and the back.

While the length of the grip on the rail base is the same—¾ in.—in six of the spikes referred to above, it is widely different in two important cases. The designs differing as to this feature are those of the Pennsylvania Railroad and the New York Central, roads in the same territory and with much the same standards, yet the grip on the Pennsylvania spike is from ½ to 9/16 in., while on the New York Central spike it is ⅞ in., or 75 per cent more. The heads of the various spikes differ in many other respects; for instance, as to thickness of the body and the shape of the back. Some spikes have heavy fillets under each side of the head and others have none at all. In the width of the head there is greater uniformity, though it varies from 1 3/16 in. to 1 7/16 in.

DERAILMENT STATISTICS

ACCORDING to accident bulletin No. 60, issued by the Interstate Commerce Commission, 5,746 derailments were reported by steam railways for the fiscal year ending June 30, 1916. Of this number, 1,673 were the result of defects of roadway and 4,073 were caused by defects of equipment. This is an increase over 1915 of 166 derailments from the former cause and an increase of 657 resulting from defective equipment. The damage to road and equipment and the cost of clearing wrecks caused by derailments resulting from defective roadway

DERAILMENTS FROM DEFECTS IN ROADWAY

Causes	Number of Accidents					
	1916	1915	1914	1913	1912	1911
Broken Rail	272	272	311	340	363	249
Spread Rail	105	90	217	231	251	153
Soft Track	349	354	356	299	327	108
Bad Ties	80	61	62	59	52	41
Sun Kinks	30	32	27	31	22	30
Irregular Track	534	415	512	533	531	179
Miscellaneous	303	283	403	466	331	465
Grand Total	1673	1507	1888	1959	1877	1225

was $1,194,800 for the fiscal year of 1916, which is $74,217 more than the damage caused by similar accidents in 1915. The total for 1916, however, is less than in the years 1912, 13 and 14, in each of which the total damage was in excess of $1,500,000. The accompanying table gives a comparison of the accidents resulting from defects of roadway for 1911 to 1916, inclusive, separated into seven classes according to cause. A study

of this table shows that there has been a material improvement with respect to accidents resulting from broken rails and spread rails, while in the case of bad ties, which cause only a relatively small number of the accidents, there has been an increase in the total number.

THE JOINT REPORT ON CONCRETE

A FINAL report has been made by the Joint Committee on Concrete and Reinforced Concrete, an organization formed by the union of special committees appointed in 1903 and 1904 by the American Society of Civil Engineers, the American Society for Testing Materials and the American Railway Engineering Association and later by the Portland Cement Association and the American Concrete Institute. Earlier reports were presented in 1909 and in 1912. The report has been printed in the proceedings of the American Society of Civil Engineers for December, 1916.

The report is not intended as a complete specification but rather as an authoritative manual of the general principles governing the design, detail and construction of concrete and reinforced concrete structures. In many respects this last report differs only slightly from that of 1912, although on some subjects considerable new information is given. The report specifically endorses the effectiveness of good concrete as a protection to any embedded steel reinforcement. It states also that, while some concrete and reinforced concrete structures have been injured by flow of electric currents, under ordinary voltages the chance for injury by electrolysis is slight and that non-reinforced concrete structures are practically immune from troubles of this kind. However, warning is given against the use of salt or calcium chloride in structures subject to appreciable electric current. While confirming current opinion to the effect that the damage to sea walls can be largely accounted for by frost action, the remarks on the effect of sea water indicate that further investigation is desirable before definite conclusions can be reached on this important phase of the use of concrete. This is true also of the report on the effect of alkalies. Of acids it is stated that dense concrete thoroughly hardened is affected appreciably only by acids which seriously injure other materials. Substances like manure that contain acids may injuriously affect green concrete but do not affect concrete that is thoroughly hardened. Concrete is reported immune from harm by such mineral oils as petroleum or ordinary engine oils but is vulnerable to fatty oils which form compounds with the lime.

In the discussion of cement portland cement alone is approved in reinforced concrete work, natural cement being limited to mass concrete where comparisons of proportions giving equivalent strength show natural cement to be cheaper. Puzzolan or slag cement is excluded from use in important work and is limited to unimportant foundation not exposed to air or running water.

Under the specifications for agggregates, blast furnace slag is specifically excluded, "especially for reinforced concrete construction," with the statement that no satisfactory specifications or methods of inspection have been developed that will insure a uniform material. Cinder concrete is permitted in reinforced concrete slabs not exceeding 8 ft. in span and in mass concrete.

The specifications for both sand or, what is termed "fine aggregates," and the coarse aggregates are very brief. For crushed stone and gravel this consists in requiring them to be "clean, hard, durable and free from all deleterious matter. Aggregates containing dust and soft flat or elongated particles should be excluded." In the specifications for the fine aggregates no attempt is made to describe sand that will produce strong mortar, but instead it recommends that all fine aggregates should be tested for the strength of mortars made from them. In this connection caution is given against the removal of any coatings on the grains which may affect the strength and that bank sands should not be dried before making them into mortar but should contain the natural moisture.

Reinforcing bars are limited to those made from billet steel and conforming to the specifications of the American Society for Testing Materials.

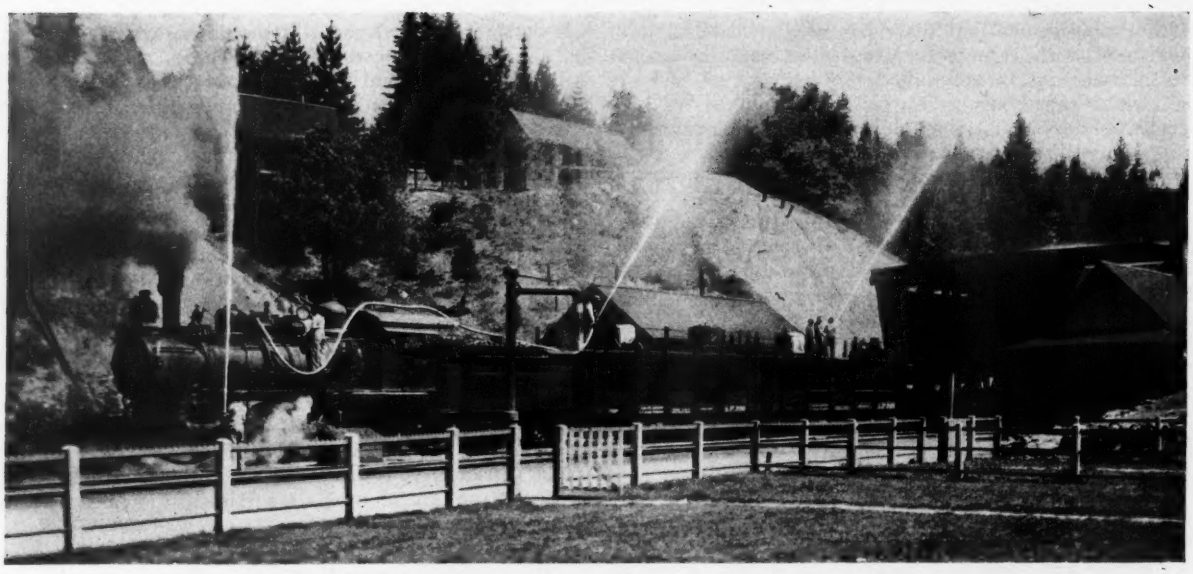
Under mixing, there are rather extended remarks concerning machine mixing with relatively little comment on hand mixing. The former calls for the use of a batch mixer and a minimum of 1½ min. mixing time in the mixer, with 2 min. for mixers of two or more cubic yards capacity. Particular stress is placed upon this matter of the time allowed for mixing as indicated by the following quotation:

"Since the strength of the concrete is dependent upon the thorough mixing, a longer time than this minimum is preferable. It is desirable to have the mixer equipped with an attachment for automatically locking the discharging device so as to prevent the emptying of the mixer until all the materials have been mixed together for the minimum time required after they are assembled in the mixer. Means should be provided to prevent aggregates being added after the mixing has commenced. The mixer should also be equipped with water storage, and an automatic measuring device which can be locked is desirable. It is also desirable to equip the mixer with a device recording the revolutions of the drum. The number of revolutions should be so regulated as to give at the periphery of the drum a uniform speed; about 200 ft. per min. seems to be the best speed in the present state of the art."

In covering the subject of the placing of concrete some space is devoted to the proper methods of spouting. The plant should be of such proportion as to insure a practically continuous stream. "The angle of the spout with the horizontal should be such as to allow the concrete to flow without separation of the ingredients, in general an angle of about 27 deg. is good practice. Tremies are recommended for concreting under water with drop bottom buckets as a second choice.

The chapter on details of construction covers joints, shrinkage and temperature changes, fireproofing and waterproofing. The splicing of bars by lapping is approved on the basis of safe bond stresses, although the use of splices in main tension bars should be avoided. No mention is made of the use of clamps of any form. The section on waterproofing states that a concrete made as dense as possible by proper proportioning and suitable consistency will be impervious to moderate pressures. The use of membranes of asphalt or coal tar preparation is also mentioned. Under surface finish the report states that "concrete is a material of individual type and should be used without effort at imitation of other building materials" and also that "the natural surface of concrete in most structures is unobjectionable."

The chapter on design, which has not been changed to any extent except for the addition of a section on flat slab construction, offers an authoritative and conservative guide to the designer of concrete structures. This applies also to the chapters on working stresses and the appendix containing formulæ for design. These will prove of great value to engineers in any designing office.



ONE OF THE FIRE TRAINS IN ACTION

PROTECTING LONG SNOW SHEDS FROM FIRE

The Southern Pacific Has Adopted an Elaborate System for These Structures in the Sierra Nevada Mountains

TO insure continuous operation on its main line over the Sierra Nevada mountains between San Francisco and Ogden, the Southern Pacific has built and maintains a total of 155,146 lin. ft. of snow sheds in a distance of approximately 29½ miles, of which about 9 miles extend over double track. These sheds and other destructible property in the vicinity are valued at approximately $1,500,000, while it is estimated that it would cost twice this amount to replace them.

Although the difficulties arising from snow slides are not as serious on this line as those encountered by the roads crossing the Cascade mountains farther north, the problem of maintaining continuous operation through the falling and drifting snows has made the construction of this large mileage of sheds advisable. The sheds are all of timber construction so that the necessity for their protection from fire is evident, not alone because of their value but also because of the interruption to the service

A SECTION OF THE SHEDS

which might result from their destruction. These conditions have led to the adoption of comprehensive system of fire protection which is of particular interest because of its unusual character.

The complete protection of these sheds from fire is a difficult one in a heavily timbered section such as this, where sheep and cattle men as well as hunters and campers start many camp fires. Special precautions must also be taken by employees to see that they do not start fires in the course of their regular work. Rules have been provided for the use of fusees while all brush and other combustible materials are removed from the vicinity of the sheds to eliminate the possibility of fires starting from the lodgment of sparks in such rubbish. As an additional precaution, telescopic sections of sheds are introduced at frequent intervals. These sections are each 100 ft. in length and are mounted on wheels or rollers which run on tracks parallel with the axis of the shed. In the summer, or in case of a fire, they are run back into enlarged portions of the adjoining sheds, leaving an open space of 100 ft. between sections, across which the flames will not ordinarily jump.

Winter Snow Conditions in the Mountains

As the mountainous territory in which the sheds are located is covered thickly with timber the problem of detecting fires quickly is a difficult one. For this reason a very complete system of communication has been developed. All of the stations are connected by telephone to afford opportunity for quick communication in the case of a fire as well as of a runaway car, train or other accident. Two complete independent lines of communication are maintained. One consists of a central office system with the office located in a reinforced concrete building at Summit station and with alarm boxes located at each mile post throughout the shed, which serve as watchmen's patrol boxes as well as for the sending in of alarms. The second system consists of regular fire alarm boxes directly connected to gongs at the points at which fire trains are located. These boxes are located at points between the patrol boxes referred to above, and are used for fire alarms only. Special watchmen are also located at particularly vulnerable points or where for any reason the sheds are not in clear view from the main lookout station. These men are located either on top of or close to the shed and turn in alarms over the patrol system to the central office. All watchmen are required to report hourly either by telephone or over the central alarm system.

In addition to the alarm system an observatory is maintained on a prominent mountain peak on the west slope of the Sierra Nevadas, known as Red mountain or Signal Peak, the summit of which is 7,860 ft. above sea level and about 2,000 ft. above the elevation of the sheds at the nearest point. As early as 1876 the value of this point for a watchman's station was recognized, but it served no useful purpose until the perfection of the telephone, when it offered one of the first practical applications of the telephone on the Pacific coast. From this observatory, which is a solid stone building, shown in one of the accompanying photographs, an unobstructed view is had of nearly all of the sheds west of Summit.

View of the Tracks from the Observatory

A transit is mounted on a solid pier in the large windows of the observatory with a silver-covered copper

plate in front of it on which is etched a map of the sheds and over which swings a knife blade pointer attached to and coinciding with the vertical plane of the axis of the transit. On this map every station, tunnel, bridge, mile post, signal box and shed opening is located. As the shed itself is not in view at night a line is etched on the plate glass of the window corresponding with the actual line of the shed as seen from the transit. The location of a fire in relation to the sheds is determined by its apparent location in reference to this line, the particular part of the shed threatened being ascertained from the location of the pointer over the horizontal map.

Aside from detecting actual fires which threaten timber lands, snow sheds and other railroad property, the watchman in this observatory keeps a close check on campers and others from his point of vantage. When camp fires are built in proximity to the sheds, word is telephoned to the nearest section headquarters and men are sent out to move the parties to a safe distance and to extinguish the offending fires. In case a fire is discovered an alarm is sent over the telephone and fire trains are called into service. While the Southern Pacific maintains this lookout station at its own expense it also cooperates with the United States Forestry Department in detecting and handling forest fires. A similar but less elaborate station is maintained at a point over the Summit tunnel from which most of the snow sheds east of the summit are in view. This station is directly connected by telephone with the central office at Summit.

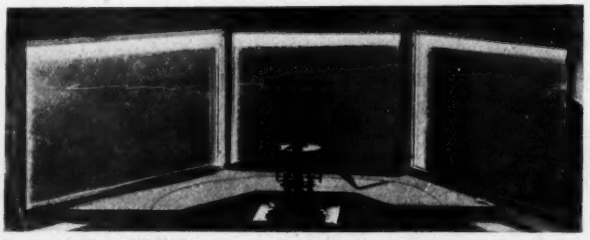
For the actual extinguishing of fires four fully-equipped fire trains are maintained continuously, each consisting of a locomotive and two water cars. One of these trains is located at each end of the snow shed district and two at intermediate points in the sheds. Steam is maintained in these engines at all times and crews are continuously on duty. Each engine carries a duplex fire

THE FRONT OF THE OBSERVATORY

pump capable of furnishing two good sized streams and an inspirator which can furnish another stream. With 1,000 ft. of standard 2½-in. hose on each train and an average of about 18,000 gal. of water, means are provided for controlling quite extensive fires.

The average number of alarms responded to by the fire trains during the past four seasons has been 18, any one of which would probably have resulted in serious damage to the sheds and consequent danger and interference with operation had not this thorough system of protection been present. This system involves an annual expenditure of approximately $50,000.

In addition to the construction of the snow sheds in the worst of the snow territory, rotary and headlight snow plows, flangers and spreaders are stationed at points convenient to other portions of this line subject to snow blockades. During each summer this equipment is overhauled and placed in good condition, being given a trial run for the purpose of testing the injectors, lubricators, etc., just before snow flies. Reliable men who have had experience in snow service, are assigned to the



THE TRANSIT AND LINE DIAGRAM

operation of the rotary plows. All of the working parts of the rotaries are covered and both bell and whistle communicating signals are installed between conductors and engineers. The rotary plows are also equipped with automatic and straight air brakes. When the pusher engine is cut off from the plow on a grade every wheel is blocked in addition to the brakes being set before the engine is detached.

A PROTECTION AGAINST CORROSION

THE maintenance of railway track and structures is commonly concerned with the corrosion of metal work of various kinds, as in the buildings around engine terminals, particularly roundhouses where ordinary steel lasts but a few months; bridge work subjected to the discharge of locomotive stacks, and track fastenings drenched by brine drippings. This difficulty is brought so frequently to the attention of maintenance officers that developments which have to do with materials that resist corrosion always excite their particular attention.

Among the latest developments is the application of the so-called Lohmannizing process to nuts, bolts, lag screws, sheets, etc., commonly used in buildings and other construction. Under this process the steel surfaces are coated with zinc, lead, antimony or alloys of these metals in a manner that is said to produce an amalgamation or welding of the coating to the steel base. In consequence the coating and the base are practically inseparable.

In a series of tests to determine the extent of this property a piece of three-quarter-inch Lohmann lead-coated pipe was crushed flat in a testing machine. The piece was then taken out and crushed in a direction at right angles to the original test, splitting the pipe in four sections. No separation of the coating from the base metal could be detected. A piece of steel wire similarly coated was bent back and forth through an angle of 180 deg. After the fortieth bending the wire broke, but no separation of the coating was indicated.

The special advantage claimed by virtue of this quality is that a steel bolt or other device may be covered with lead or other non-corroding metal and that the continuity of the coating is not disturbed in any way by the deformation of the bolt under the stresses to which it is subjected in service. As lead coatings are entirely practicable under this process, the particular resistive qualities of this metal are secured, together with the advantage of the low temperature (650 deg. F.) at which the process can be completed with this metal. It is also

said that in the case of bolts or pipe no recutting of the threads is necessary after the application of the coating, and the presence of the lead in the grip of the bolt upon the nut serves to hold the nut tight.

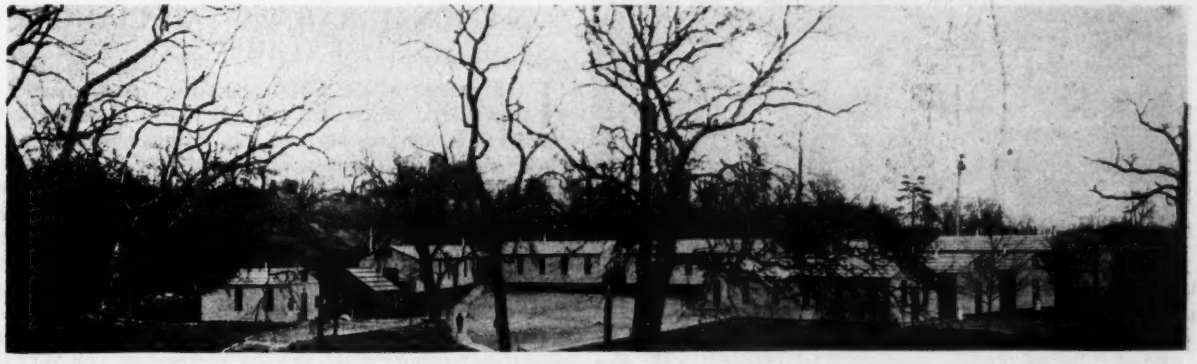
Materials protected with this coating have been subjected to service and special tests of various kinds. A Lohmannized steel smoke jack is being tested in this manner and while the test is not complete, examination at the end of 16 months disclosed no corrosion of the steel. Other tests have been made indicating the resistance of the coatings to various corrosive gases, salt fogs and the like. Treated track bolts in use for three years in a tunnel near New York City are giving excellent service. Bolts, nuts and other fastenings subjected to this process are being manufactured by Johns & Co., Inc., New York City.

Housing and Caring for the Laborer

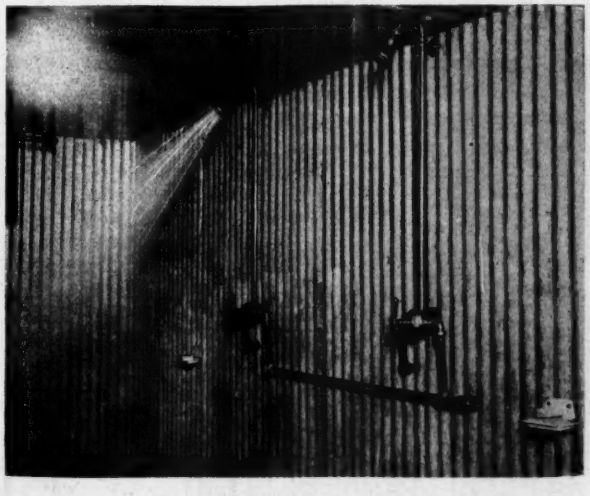
BY S. H. ROGERS,
Employment Department, Pennsylvania Railroad

OWING to a scarcity of labor, and the increase in the amount of construction work, a number of the eastern roads have found it necessary to import men from other parts of the country and provide quarters for them. A number of camps for such men have been constructed in and around Philadelphia. The following is a description of one having a capacity of 200 men.

The equipment consists of 1 commissary and office building, 20 ft. by 20 ft.; 1 dining-room and kitchen, 20 ft. by 90 ft.; 5 bunk houses, 20 ft. by 50 ft.; 1 shower bath and toilet, 20 ft. by 20 ft.; a toilet and laundry, 20 ft. by 20 ft., and a recreation room, 20 ft. by 50 ft. All the buildings are of wood and are made according to a standard plan in units of 10 ft. each. They are covered with "Tyolite" and are equipped with stoves sufficient for heating. The units are cut and fitted at the shops, and are easily erected wherever necessary. They are really knock-down, portable buildings.

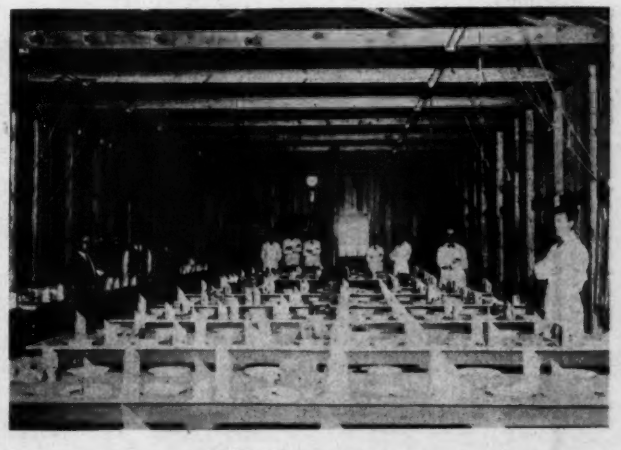


A GENERAL VIEW OF THE CAMP



A VIEW OF THE SHOWER BATHS

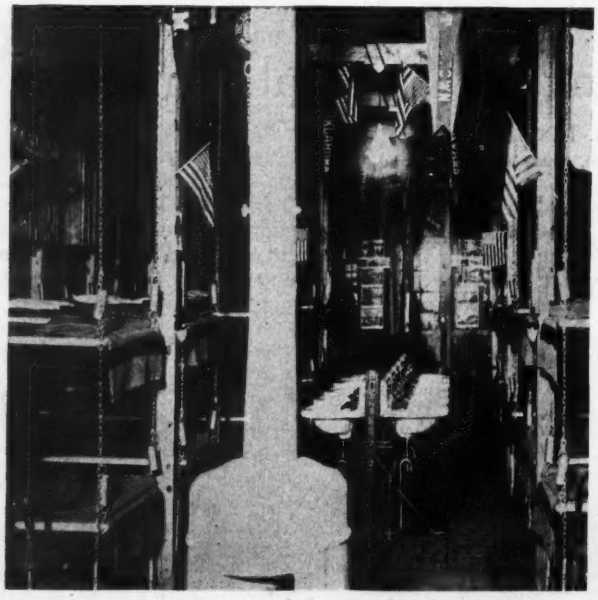
The commissary and office is used for the storage of eatables, and as an office for the routine work of the camp. The dining-room and kitchen has a seating capacity of 200 men, containing tables covered with oil cloth. The dishes are all of enamelware and easily kept clean. The kitchen is situated at one end of the dining-room and contains a 12-ft. range, electric potato peeler, refrigerator, etc.



THE DINING ROOM

The bunk houses are equipped with "Gosso" beds, with the bunks, arranged 20 on either side of the room, 10 upper and 10 lower. Each building accommodates 40

chain, thereby furnishing quarters for 20 additional men. Wooden lockers are furnished each man with lock and key, where he may keep his personal belongings. The linen on the beds is changed each week and each man has three blankets, which are laundered frequently. Each bunk room contains 10 modern "standard" stationary wash stands, with running hot and cold water.



INTERIOR OF THE SLEEPING QUARTERS

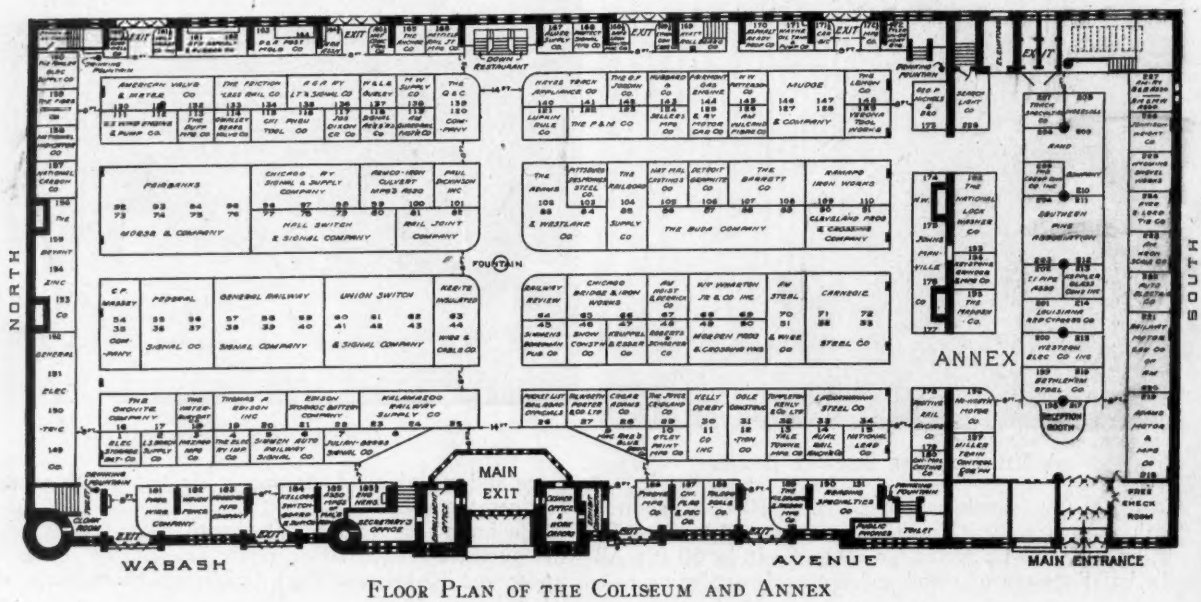
The shower bath is fitted with a perforated pipe on three sides of the room, capable of caring for 20 men at one time. There are also two individual showers with dressing-room and 10 toilets. The laundry and toilet contains two large stationary wash tubs and additional toilet facilities. Part of the building is used as a boiler room to heat the water for use in the camp. The recreation room has a number of small tables suitable for writing or games and a victrola. In this building the Y. M. C. A. holds meetings and lectures for the men in the evenings.

The camps are kept absolutely sanitary, frequent inspections being made by various officers and medical authorities, as the camp is located within the city limits. A medical examiner visits the camp each day to care for any men who may be sick and a first aid cabinet is maintained in the office. When a man is hired he must take a bath the first thing. The camp is supplied with city water and is drained into a city sewer. All the buildings are equipped with screens and as a preventive against vermin, etc., a very strong disinfectant is used frequently.

The camp is in charge of a representative of the railroad, but the commissary is conducted by a contractor. All the kitchen help and waiters are supplied by the railroad. Each bunk room is taken care of by a janitor, who makes the beds and keeps the rooms clean. All of the equipment is furnished by the railroad, including kitchen utensils, dishes, pillows, blankets, towels and games for the men, while the Y. M. C. A. furnishes reading matter. There is also quite a library of *Railway Age Gazettes* and similar railway magazines.

NATIONAL RAILWAY APPLIANCES EXHIBIT

THE exhibit of the National Railway Appliances Association, which will be held in the Coliseum and Annex, Chicago, on March 19 to 22 inclusive, bids fair to be one of the most successful which this association has ever held. All available space was assigned some time ago and over 40 firms are on the waiting list. The list of members of this association was published in the issue of last month. All but 12 of these will exhibit. The floor plan of the Coliseum and Annex showing the location of the different exhibits is shown herewith. An innovation this year is the making of the Annex entrance the main entrance and using the center doors on Wabash avenue for exit only. This plan removes the objection raised in previous years that the space in the Annex was not desirable because of the difficulty in getting railway men to visit that part of the building. As usual, the signal exhibits are grouped at the north end of the building. Following the innovation last year, several of the lumber associations will present exhibits. These will be grouped in the Annex. Several associations of manufacturers will also exhibit jointly.



FLOOR PLAN OF THE COLISEUM AND ANNEX

CONDITIONS IN THE LABOR MARKET

A Survey of the Country Indicates that There Will Be a Severe Shortage of Men for Maintenance Work This Season

THE most pressing problem confronting the engineering and maintenance of way departments today is that of securing an adequate supply of labor to do the routine maintenance and the large amount of improvement work for which appropriations are available. There was a serious shortage of men last year, but the present indications are that this condition will be materially worse this year. It is more acute in the vicinity of the large industrial centers, but is pronounced almost everywhere.

To ascertain the exact conditions in the different parts of the United States and Canada we have written to men familiar with the labor conditions in the various centers. We publish below abstracts of their replies:

In New England

There is absolutely no doubt about it—the labor situation is serious, as far as track maintenance goes. We had difficulty last year, although this, in my opinion, was not altogether due to the shortage of labor, but was also caused in a great measure by the general unrest among laborers. Apparently what the men were paid did not keep them satisfied. They kept coming and going. On one subdivision we did not have a man on the rolls on November 5 that we had on July 1, aside from the foreman, assistant foreman, track walkers and possibly second hands. There seems to be an ample supply of labor, if one could get the men to work when he secures them. I believe it would be possible to go into Boston to-day and get 3,000 or 4,000 laborers, but when one gets them out on the job they will work for only a couple of hours and then go away.

In regard to the prospects for next season, we are now paying our track laborers $2 per day of 10 hours, and at that rate, with the quieting down of the unsettled conditions among them, I anticipate being able to hold the men I have and I hope to get some additional forces. There is a large amount of work which we have got to do. I think it is conservative to say that 25 per cent of normal maintenance was not done last year which should be done this year, if the track is to be kept up to economical standards. One can state it in another way by saying that, owing to conditions last year we will have to do 125 per cent of the normal amount of maintenance work this year instead of 100 per cent if we can. There is also a very great need, if anything like the present traffic is to keep up, for additional trackage and extra yard accommodations, which will entail a very large amount of construction work. *F. B. Freeman, chief engineer, Boston & Albany.*

In Eastern Canada

The general labor situation in Canada is much disturbed by reason of the war. There has been a marked shortage of labor of all classes, due somewhat to the great development of munition manufacture and the heavy enlistment. The prospects appear to me to be favorable for a continuation of this condition during the coming year. We are not undertaking any extensive program of improvement work, and will doubtless confine our activities to our current maintenance needs, with the exception of occasional improvements demanded by the industrial development. *H. R. Safford, chief engineer, Grand Trunk.*

Near New York

There is an insufficient supply of labor at the present time to meet the requirements. A large percentage of the labor now being utilized on our section and extra gangs on the track is secured from New York City and is of all nationalities. Very few Italians, Hungarians or foreigners of any kind are to be had, the only Italian and other foreign labor that we now have being a few of the older men who have their homes on the different sections along our line. It is impossible to secure sufficient men for extra work in case of snow, etc. The present labor is very independent and it is almost impossible to get men to work after a ten-hour working day. In fact, it is necessary to pay them extra compensation for time worked after ten hours.

Practically all of the roads in the East are having more or less trouble in securing a sufficient number of men to meet their requirements and it is practically impossible to get a high grade of labor at this time. The present outlook for labor for the summer of 1917 is not the brightest. I doubt whether we will have any improvement in the labor market this year. *A. J. Neafie, principal assistant engineer, Delaware, Lackawanna & Western.*

In the East

At the present time the maintenance demands for labor are light, because of the season of the year. However, we have a number of pieces of improvement and construction work under way which in the aggregate amount to considerable and require quite a large number of men. We are able at the present time to keep up our maintenance forces and, while we could use more men on the construction and improvement work, we are held up to such an extent by the non-delivery of materials as to make it inadvisable to carry much larger forces.

At the present time, outside of the industrial centers, a good supply of native labor is to be had, in most instances sufficient to take care of the section work. For extra gangs and to meet the demands in industrial centers we are relying largely on the southern negro and hobo labor, with a few Greek and Austrian gangs.

We anticipate doing a normal amount of maintenance work this season, with a moderate amount of construction and improvement work. It is difficult to predict just what the situation will be, as so much depends upon the course of pending events. However, I do not anticipate any more trouble in getting labor the coming season than we had last season. *Earl Stimson, engineer maintenance of way, Baltimore & Ohio.*

In the Pittsburgh District

Probably the lowest labor rate paid in the Pittsburgh district for common labor is 20 cents an hour, a ten-hour day only being allowed. If there are any lower rates, the difference is made up by more hours being allowed. The decision as to the necessity of raising this rate this spring will depend upon the labor conditions. If this raise is made, it will not be over 22 cents an hour. The railways cannot meet any competition. The demand for common labor in the mill districts is great and the difference in pay is large. The same is true of competition with contractors on important construction work.

A normal maintenance program is to be carried out, and while construction work is under consideration, the high price of materials will delay it, giving an opportunity to purchase the necessary property beforehand, and thus be in better shape to rush the construction work when conditions are more favorable. Contractors on construction work now under way have difficulty in obtaining enough satisfactory men for their work.

Special attention has been given by railroads and contractors to better camping conditions for extra gang labor, and in several instances some of the men are being boarded by a camp arrangement. There are plenty of men on our lines to do the work now, and we are preparing to recruit the force with a small number of colored men, in addition to the foreign labor ordinarily employed in this territory. *Division Engineer.*

In the South

So far as the lines under my jurisdiction are concerned, the prospects now are that the maintenance, improvement and new construction work to be handled this year will equal, if not exceed, the amount of similar work handled last year. Prospects for an adequate supply of labor are not quite as good as last year through the South, owing to the fact that a large number of negro laborers have gone North to supply labor demands in the northern sections of the country. *Curtis Dougherty, chief engineer maintenance of way and structures, Queen & Crescent.*

Near Detroit

Labor was exceedingly scarce with us in 1916. We brought many hundred colored laborers from the South, but at no time had we working more than 10 per cent of the total number brought in. They seemed to melt away as soon as they arrived. There is probably no place in the country where labor is so greatly in demand as in Detroit and its vicinity. It has been almost impossible to keep our ordinary maintenance gangs (to say nothing of our extra gangs) filled in and around Detroit. For the first 25 or 30 miles out of Detroit last year we had no regular section men for long periods, but had to bring in small extra gangs to take care of the necessary maintenance.

As a general thing, we were successful in obtaining reasonably good sized gangs for ordinary maintenance work along the line outside of the larger towns and I believe the same condition will obtain in 1917; but I believe that the men for extra gangs are going to be much scarcer this year than they were last. We have a large quantity of work to be done this year by extra gangs and it is my desire to get at this work just as early as weather conditions will permit and endeavor to hold these men throughout the season. In the smaller cities the improvement work does not seem to start until after the middle of the year, as a general thing, and up to that time we are more successful in holding the men than later in the season when such work as the construction of sewers, paving, etc., is being done by these smaller cities.

On our lines through Canada we were successful in keeping the regular maintenance gangs, with a few exceptions, well filled last year. but these men will not go away from home and consequently our extra gangs have had very few men and there does not seem to be any source to draw from. The government in Canada has been quite liberal and if we could get Americans or of the nationalities that are not enemies of Great Britain, I think they would permit us to take these men in; but as labor is so scarce in the United States there is very little hope of doing anything of that kind. *Geo. H. Webb, chief engineer, Michigan Central.*

In the Chicago District

The Elgin, Joliet & Eastern is now paying section men $2.75 per day for 10 hours' work. Of course, under these conditions we are getting all the men we want, and I anticipate no trouble in getting all the men that we will need for our maintenance work during the coming summer, unless other roads increase their rates to our figures. In that case we will undoubtedly be short some labor. Our program for maintenance improvements and new construction work the coming year contains nothing of special moment, and it will probably not exceed the amount of work done during the past year. *Arthur Montzheimer, chief engineer, Elgin, Joliet & Eastern.*

In the Southwest

During the past year the railroads in the Southwest enjoyed the greatest business that they have ever obtained, and while expenses have been high, the net result is that there is now considerable money in their treasureries which, under ordinary conditions, would be applied on large appropriations, both for additions and betterments and for maintenance work. During the past year there existed probably the greatest labor shortage that we have ever had in this country. Early in the season the railroad labor market became demoralized, and greatly increased wages were paid to secure men to carry on the work.

The appropriations made for additions and betterments, as well as for maintenance work, were larger on most railroads than they ever have been before, but it was impossible to carry on such programs for the reason that the labor supply was not sufficient. I believe I state the case generally for all railroads in the Southwest when I say that they would make appropriations on a large scale for additions and betterments and maintenance work if thev did not know the necessity for curtailing such work for the reason that it will be impossible to secure the labor necessary for its prosecution.

It is believed that railroad labor in the Southwest will be scarcer this year than it has ever been in the past, at least everything points to this situation. Comparatively speaking, there are few foreigners in the country, and such as are here, like other classes of labor, are seeking employment at materially higher wages in industries adjacent to the southwestern lines, as well as in the eastern markets. There has never been a time when railroad employees have been so importuned by outsiders representing industrial concerns to leave their railroad positions and enter industrial plants at higher wages. The local labor adjacent to our lines is likewise receiving higher wages in industrial pursuits, and farm hands and others similarly situated are not seeking employment in track forces as a means to tide them over dull periods to the extent they have heretofore. The railroads are, therefore, dependent upon recruiting their forces from a largely reduced labor supply.

The Rock Island, like other southwestern railroads, has always recruited a considerable portion of its forces from Mexico, and, even with conditions that have prevailed in that country for some time past, has been able to secure a considerable number of Mexican laborers for track work. If conditions resume their normal sway in that country we should be able to secure a considerably larger number of such employes. In addition, negroes from the South will be shipped to the northern territory to improve the labor situation, but even with these expedients successfully used, the labor shortage is going to be of considerable proportions for the reason that we are now competing for such labor with lines which have never before been interested in this particular territory.

Further, recent national legislation, whereby the literacy test clause was included in the immigration bill, while having no appreciable effect at the present time, will, of course, be the means of continuing the present scarcity of labor on American railways.

Boom times generally are poor times to secure efficiency in track labor, and railroads in the past year have, and will, to a greater extent during the present year, feel the economic effect of this situation. As a general situation, therefore, I feel that while roads have money and are willing to spend it on improvement and maintenance work, such programs must of necessity be largely curtailed on account of the labor situation. Further, what little labor market there is left now will soon be demoralized by the railroads themselves bidding against each other for such labor as is required to perform the necessary improvement work. The wage scale will be higher than it has ever been, and the efficiency of labor less. The combination of these conditions does not tend to give railroad officers a very roseate view of the situation. *H. G. Clark, assistant to chief operating officer, Chicago, Rock Island & Pacific.*

IN THE NORTHWEST

The labor situation during the last year was rather bad. The supply was not equal to the demand, which had the immediate effect of one road or another raising the wages from time to time, with the further effect that men were coaxed from one road to the other by the inducement of higher wages. In so far as the bridge and building department is concerned, particularly as applying to maintenance work, we have a certain nucleus in our crews on which we can depend. These are the older men who appreciate steady employment. They are not easily influenced by the varying conditions such as quickly influence the floating element.

It happened that our maintenance work for 1916 was exceptionally heavy. This was not due to the generally prosperous conditions, but simply to a natural condition which results in maintenance work, including the renewal of temporary bridges, being heavier some years than others. Our building work was also exceptionally heavy, owing to the reason just stated, and also to the greater liberality on the part of the management in authorizing work which probably would not have been done under less prosperous conditions.

As the amount of work was much greater, it required a larger number of men and it was difficult to secure them. In fact, while our maintenance work on bridges and buildings is ordinarily cleaned up by January 1, we were compelled to set March 1 as the final date of completion for last year's work. Our work this year will be nearly as extensive as last, and from the present outlook we will have more difficulty than last year securing labor. We are also doing more betterment work this year in yard extensions, new shop buildings, roundhouses, depot facilities, etc. It is my intention to have as much of the work done by contract as can possibly be done, in order to distribute the task of finding the necessary labor for all of the work among as many men as possible. *H. Rettinghouse, chief engineer, Chicago, St. Paul, Minenapolis & Omaha.*

IN THE INTER-MOUNTAIN TERRITORY

The inclination of railways operating in the intermountain region is to exercise a rather liberal policy in authorizing improvements which either have been contemplated for some time past or have been shown necessary as a result of last year's unprecedented traffic. Some authorizations last year both for regular maintenance and for additions and betterments were uncompleted at the close of the season owing to the scarcity of labor and tardy delivery of material. This imposes an unusual burden for the approaching season without a very promising outlook as regards labor conditions. Not only is there serious concern on account of the extra amount of work to be performed, but its accomplishment under the anticipated heavy volume of traffic also exacts its toll of difficulties.

Judging the situation by a retrospect of past circumstances the possibility of a labor shortage becomes a pronounced probability, especially later in the season. The employment of an abnormal amount of common labor in the industrial pursuits such as coal and metal mining, the manufacture of steel, iron and allied products, the smelting of metalliferous ores and lumbering, has continued through the winter months without the usual midwinter reduction. There are apparently at this date no idle men save perhaps a few scattered over the region on farms and ranches only awaiting, for a very brief period, the preparatory activities in the planting of early crops.

In fact, the railway labor situation is to-day less encouraging than a year ago. The only relief from this condition of grave importance apparently lies in the fact that changes in commercial and industrial affairs which are sure to come about this year will lessen the stringency temporarily while such transformations are taking place. A lessening of activity in one line and a corresponding increase in another always means a period of relative idleness until equilibrium is restored, and while the general prosperity of the whole country will doubtless continue with unabated momentum, there will certainly be a shifting of many concentrated energies, hence a few loopholes for the labor agencies.

All that can be done consists in the earliest possible start on the season's work, the crowding to the limit at all times of all available labor, and the enlisting of every ingenuity and known resource in the conduct of the task. *Arthur Ridgway, assistant chief engineer, Denver & Rio Grande.*

ALONG THE MEXICAN BORDER

As the maintenance of way labor on the railroads along the border in the Southwest is principally Mexican, the situation in Mexico has made it rather difficult to secure additional labor and the scarcity of labor in the Southwest corresponds in a general way with that over the country at large.

I know of nothing special or out of the ordinary relative to maintenance, improvement or new construction work in the Southwest. The business of the railways during the past year or two in this territory has been such that they generally feel that they can keep their maintenance up to the mark. I know of no new construction work planned or in contemplation. *J. L. Campbell, engineer maintenance of way, El Paso & Southwestern.*

ON THE PACIFIC COAST

About the middle of last summer we increased our rate for common labor from $1.75 to $2 per day, and held this rate until December 1, 1916, at which time we went back to the old rate of $1.75 per day for the winter months. At the present time there is no general shortage, but signs are multiplying that with the opening of spring our forces will be rapidly depleted by the drift into lumber camps, agricultural pursuits and other occupations of a seasonal character. In order to prevent this as much as possible we have decided to resume the $2 rate on March 1. The above does not apply to that por-

tion of our line where Mexican labor is exclusively employed in track work, as in southern California, Arizona and New Mexico, the class of men in that locality being fairly stable the year round.

There appears to be little or no railroad construction work in view for the coming season; maintenance and betterment work, however, will be prosecuted at a rate that is fully up to normal, provided labor shortage does not prevent.

With the increased rate that will become effective on March 1, we will probably succeed in holding a fair force through the season, but possibly not enough to completely fill our requirements. The practical stoppage of the immigration of foreign labor and the noticeable drift of labor eastward to the industrial centers has depleted the supply on the Pacific Coast to a noticeable extent. *J. Q. Barlow, assistant chief engineer, Southern Pacific.*

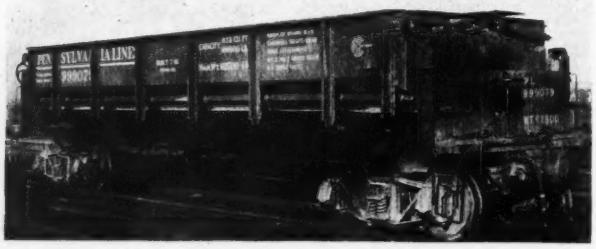
IN THE CANADIAN NORTHWEST

So far we have not had very much trouble in obtaining enough labor. Most of the men have come from the prairies, and are of a very good type. These men have come west on the strength of reports that the labor market in Vancouver is very tight and that they can get high wages. Althought it is undoubtedly a fact that labor is somewhat scarce, still it does not seem very hard to get men for outside work if the wages demanded are paid.

Our appropriations for this year will not total what we used to get three or four years ago. If we can get all of our heavy work done during the early part of the summer I do not think we will be short of labor. However, if our work should extend until fall we will undoubtedly lose a number of our good men by reason of their going to the prairies for harvesting work. The other roads in British Columbia, the Pacific Great Eastern, the Canadian Northern, the Grand Trunk Pacific and the Great Northern, are not contemplating work of any magnitude this season. The ordinary maintenance work will, of course, be carried on, but little new work will be undertaken. *H. Rindal, engineer, Canadian Pacific, Vancouver, B. C.*

An Extension Side-Dump Car

THE impetus given to ditching with a growing realization of the necessity for good drainage has resulted in a constantly increasing demand for improved equipment for conducting ditching operations from main line tracks. The conduct of this work in a manner that will avoid delays to traffic and yet secure some degree of economy demands not only excavating machinery that will form a ditch of the required section with neatness and efficiency, but also requires cars that can be dumped with a minimum amount of hand labor either when emptying them or clearing the tracks of the dumped material. The utilization of even a small number of laborers for these operations involves a definite expenditure of time and is uneconomical because the men can be employed profitably only a small portion of the time.



THE CLARK CAR

An extension side-dump car has been recently introduced for use in ditching and other dirt handling service by which the load can be dumped without any hand labor, at a sufficient distance from the track to preclude the fouling of the rail or operating clearance by the dumped material. It is an all-steel car in which an independent box, supported by rockers on the bolsters of an underframe or draftframe, is caused to rock to either side through the action of cylinders operated by compressed air for the purpose of dumping the load. The sides of the car are hinged at the bottom and secured in place through an ingenious link and toggle system, which causes the side of the car on the low side to swing down during the tipping movement of the box and form an apron on which the load slides out at a safe distance from the rail. By means of an air cylinder which releases a latch in the link system the high side of the car is secured in its normal position during the operation. For further security a lock is provided at each end of the car, so arranged that only one side of the car can be unlocked at a given time.

The power for dumping the car is provided by a telescopic dumping cylinder attached to each end of the movable box and arranged to force a plunger against a seat on an upright end frame attached to each end of the underframe. The center of gravity of the empty box is sufficiently low to cause it to roll back into the upright position when empty. In the filled box the center of gravity is higher, but equilibrium is obtained by providing a flat place in the center of each rocker surface. Thus

APPEARANCE OF THE BANK AFTER USING CAR

the greatest effort to tip the box is required only to roll it off this flat spot and when over-balanced it will dump itself, returning again to the upright position when the air pressure in the dumping cylinder is released.

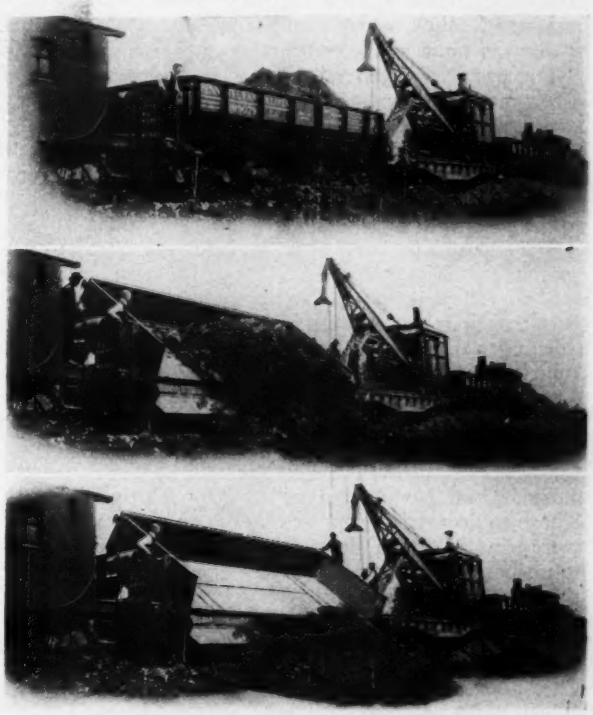
The compressed air system is designed to receive air by an independent 1¼-in. supply line direct from the locomotive receiver. Storage sufficient to dump the car when detached from the engine is afforded by a reservoir provided under each car having a capacity of 7.14 cu. ft. Air from the reservoir is supplied to the latch lever cylinder and to the two dumping cylinders through a line controlled by a reservoir-operating valve which is actuated by the release of air from a ⅜-in. control pipe line. The cars may be dumped independently by means of a valve in this control line near the end of each car, or if a long train is to be handled, this ⅜-in. line can be carried to the engine to be operated by means of a control valve placed in the cab.

The usual service in which cars of this kind are used ordinarily calls for dumping on one side of the track only for a considerable length of time. Taking advantage of this, the dumping cylinders are not provided in duplicate, but are arranged to be changed over from the position for dumping on one side to the reverse. To do this, cylinders are turned about a vertical pivot until they face towards the opposite side of the car. The only other change necessary is the shifting of a pin connecting the latch cylinder to the link motion on one or the other side of the car.

The cars as ordinarily provided for steam railway use are designed for 120,000 lb. capacity with a box that will hold 30 cu. yd. level full and 45 cu. yd. heaped full. They comply with Interstate Commerce Commission safety appliance rules and will be accepted in interchange under load.

These cars have been used for ditching on the Pennsylvania Lines West and on the Union Railway at Pittsburgh and 50 of them are being used in spoil disposal service by the Utah Copper Company. In ditching work they have been handled with no other force than the regular train crew and the two men on the ditcher. It is said that the time between stopping and starting at the dump will vary from 25 to 30 sec. Where the ground is low enough the car and apron clear entirely, but if it is such that some material remains on the apron all that is necessary is to move the train in either direction a short distance to permit the material to be plowed off. The material is deposited the same distance away from the track in any case.

At the Utah Copper Company mine the cars are used in trains of five cars each and it has been found that two



THE CAR IN DIFFERENT POSITIONS

such trains will handle more material than was formerly handled by three trains consisting of 12 12-cu. yd. side dump cars each, while 24 additional men formerly required to dress the material on the embankment have been eliminated.

These cars are manufactured by the Clark Car Company, Pittsburgh, Pa.

Service Tests of Fence Posts*

BY HARLOW BRADLEY,
Assistant Engineer, Forest Products Laboratory, Madison, Wis.

FOR a number of years the United States Forest Service, in co-operation with various state agricultural experiment stations, has been conducting a series of experiments with treated and untreated fence posts. The experimental posts were installed from 1906 to 1909 and have been inspected from time to time since then. This report briefly describes the experiments and presents the results thus far secured.

METHOD OF TREATING AND SETTING POSTS

The posts were given a variety of treatments in an effort to develop the most satisfactory apparatus and method for use on the farm, this being the primary object of the experiment. The open-tank method of treatment, which has proved to be the most practical for this purpose, is carried on about as follows:

The butt of the post is soaked for a time in the hot preservative (200 to 220 deg. F.). In this way the air and moisture in the wood are expanded and partially forced out, very little oil being absorbed during this operation. The post is then allowed to cool in the same oil for several hours. As the interior of the wood cools, the air contracts and the preservative is drawn in. This is known as a single-tank treatment. The top of the post remains untreated. At the end of the hot bath the post may be removed and either the butt or the entire post submerged in a second tank containing cold or cooling oil. This is the double-tank treatment, and where the post is totally submerged the top receives a light treatment due to the soaking action of the wood.

Either the single or double tank method of treatment was applied to most of the posts, although the brush treatment, soaking treatment (in cold oil) and charring

*Abstracted from Bulletin No. 187 of the American Railway Engineering Association.

were also tried. The brush treatment consists in painting the post with two or three coats of hot creosote, generally using a wide brush for the purpose. In the soaking or dipping treatments the posts were merely submerged in cold or warm oil for a few minutes. The soaking treatment should not be confused with the open-tank treatment, which depends on the partial vacuum created within the wood by the contraction of the air.

The posts were generally placed in the ground within a few months after the treatment, but in some cases they were piled in the open for about a year before setting. While this condition is not so severe on the posts as setting in the ground, it undoubtedly has some effect on their life. Numbered brass tags or zinc strips fastened to the posts with nails were used to identify them.

The inspections were usually made at about the same season of the year in which the posts were set. The method followed was to examine each post for signs of decay, such as the fruiting bodies of fungus, to tap with a hammer for interior rot and to give the top a push of sufficient force to break those badly decayed at the ground line.

Posts found to be in apparently good condition were classed "sound," those which showed signs of decay in the butt or top, but which were still serviceable, were classed "butt partly decayed" or "top partly decayed." Those so decayed in tops or butts as to warrant removal were classed "tops decayed" or "butts decayed" and those posts which were reported removed for decay by the station authorities were classed "removed for decay." All posts of which no trace could be found, but which were recorded as "sound" at the previous inspections, were marked "missing."

THE EXPERIMENT STATIONS

The experiment was carried out in co-operation with the following agricultural experiment stations:

South Carolina Agricultural Experiment Station, Clemson College, S. C.; Alabama Polytechnic Institute, Auburn, Ala.; North Louisiana Agricultural Experiment Station, Calhoun, La.; University of Minnesota, Zumbra Heights, Minn.; Iowa State College, Ames, Iowa; Maryland Agricultural College, College Park, Md.

It is evident, from this list, that the posts were set under widely varying climatic and soil conditions. Furthermore, while determining the best methods of operation which required changing the time of treatment and temperature, obviously some posts would be poorly treated and others would receive an excellent penetration and absorption. Such factors must be taken into account when making an analysis of the inspection records, or the results of the tests.

The posts at Clemson College, S. C., were treated in August and September, 1908, and were set between January and August, 1909. They were open piled on the ground while waiting to be set. The conditions here as regards decay are very severe. Many of the posts received poor treatments because of the experiments to determine the best method of treatment.

The posts at Auburn, Ala., were open piled for about 2½ years after treatment, and had been in service in the ground for about 4 years at the time of the last inspection. Twenty-five of the pine and gum posts were treated in a green or water-soaked condition, resulting in very irregular penetration. It has been impossible to determine which of the posts these are, but in all probability this accounts for much of the decay occurring in these species.

At the North Louisiana station the posts were treated in the summer of 1907 and were set at intervals between March, 1908, and March, 1910. All posts were open piled during the interval between treatment and setting. As a whole, the results of the experiment at this station have been very good. In all 856 out of 929 posts, or 92.2 per cent, are still sound, and only 38, or 4.1 per cent are so badly decayed as to warrant early removal after 4½ to 6½ years of service. A large proportion of the decayed posts were partially covered in a landslide, and, not being treated to a sufficient height to allow for this accident, the lightly-treated tops were subjected to ground line conditions which hastened decay.

At the Iowa station 790 posts of various species were treated with coal-tar creosote by the open-tank method in 1908 and 1909. Approximately 550 of these posts were white cedar and the remainder were local species, such as willow, basswood, red elm, ash, black walnut and butternut. From the poor penetrations noted in the sapwood of some of these posts it is quite possible that they were not all well seasoned before treatment. Apparently the depth of the oil in the treating tank was at times allowed to become too low, and some posts were not treated as high as the ground line; therefore, decay set in. This condition was found chiefly in the native species, while the white cedar posts were apparently well treated.

Nine hundred and ninety-five posts of local species were treated with coal-tar creosote and water-gas-tar creosote at the University of Minnesota in 1908 and 1909. The method of treatment varied from dipping in cold oil to the double-tank treatment. Most of these posts were in good condition after 4½ years of service. Decay was found, however, in a number of basswood posts which had been treated by dipping in cold oil for one to five hours. The decay apparently had entered the posts through old staple holes or other defects after treatment.

At the Maryland station 975 posts of various species were treated in 1908. These were all round, 7-ft. posts, with the exception of 20 split from large locust posts. All were peeled before treatment and were beveled at the top to shed water. The diameter varied, being from 2½ in. to 7 in. at the small end. The treatments were made with coal-tar creosote, crude petroleum, semi-liquid asphalt or asphaltum and water-gas-tar, the last three, however, being intended only as the heating media in the hot bath, as described under the open-tank treatment.

RESULTS OF THE INSPECTIONS

The posts removed were all decayed and broken off at the ground line. Many cases were noted in which decay had entered treated posts through checks, which had probably appeared after treatment. Decay was sometimes noted in the tops of untreated posts, but in most cases it was more severe at the ground line. Decay appeared to be more severe around chicken yards, pig sties and barnyards than in cultivated fields, wood lots, etc.

Following are a number of points which should be given consideration: More time must elapse before durability of the treated basswood posts can be depended upon. The high percentage of removals in the case of the basswood given a soaking treatment in cold oil indicates that this treatment is not effective. The treatments with water-gas-tar creosote have prevented decay thus far and have apparently given better results than the treatments with undistilled water-gas-tar.

The bay posts set at Calhoun, La., were decayed to a much greater extent than any other species at that station. The decay in the elm posts set at Ames was largely due to the fact that the butt treatment did not extend to a sufficient height to insure protection at the ground line.

The black gum posts at Clemson College received a poor treatment. The coal-tar creosote brush treatment and the soaking treatment with water-gas-tar appeared to be of little value in preventing decay in these posts.

The decay in the sweet gum posts at Auburn is accounted for by the fact that a large percentage were treated in the green condition. At Clemson College the butts only were treated, probably insufficiently, and the conditions of service were severe. With a good treatment both sweet gum and black gum posts should be fairly durable. The number of these posts included in the tests is too small to warrant conclusions being drawn.

The old field pine used at Clemson College is the second growth yellow pine of various botanical species, but mostly of shortleaf pine. A comparatively large amount of decay at Calhoun is explained by poor treatments obtained in certain runs. At Auburn some of the posts were treated while green.

The treatment with semi-liquid asphaltum was not successful, as little or no penetration could be secured. The oil is difficult to heat and hardens on the outside of the wood when the post is lifted from the hot bath. The soaking treatment using water-gas-tar was comparatively effective, possibly because the dry loblolly pine absorbed a considerable amount of the tar.

CONCLUSIONS

The data show that nondurable species, especially in the South, should have at least a light top treatment in addition to the heavier butt treatment. Brush treatments, soaking in cold-oil and double-tank treatments, where asphaltum was used as the heating media in the hot bath, were not very effective in preventing decay in nondurable species. Charring was apparently of no value. Care must be taken to have the butt treatment extend well above the ground line to allow for possible changes that may occur in the ground level and for possible carelessness in setting.

Butternut and willow decayed so readily in the tops that a heavy treatment of the entire post seems advisable. An especially good treatment appears necessary in basswood if satisfactory service is to be obtained.

Conditions seem to be more favorable for decay when posts are set around yards, pig sties, chicken yards, barnyards, etc., than when set in fields, meadows or wood lots.

The results clearly indicate that a good open-tank treatment of fence posts with creosote will give satisfactory results in preventing decay in most of the nondurable species. Posts treated with water-gas-tar creosote and water-gas-tar have stood up very well thus far. Those treated with the creosote are in somewhat better condition than those treated with the tar.

NOVEL METHOD OF MOVING A DEPOT

By W. L. Fox,

Supervisor, Nashville, Chattanooga & St. Louis, Marietta, Ga.

IN order to make room for a new depot at Sparta, Tenn., it was necessary to move the temporary structure a distance of 200 ft., and a rather novel plan was adopted, because it was impossible to get regular house-moving equipment within the time limit. The building was raised a sufficient amount to pass two flat cars under it and it was then hauled to the new site on the cars.

The building was a tar-paper covered structure, 18 ft. by 70 ft. in size, built of oak framing, and only about 18 months old. The floor in the freight room was 2½ ft. higher than in the waiting room, making it necessary to jack the freight room end nearly 8 ft. In raising the building six ordinary Barrett track jacks were used on each side, spaced approximately equidistant, while in lowering it only four were used on each side. Track ties were used for crib work, four cribs being placed on each side of the building far enough to the sides to give clearance for the cars.

Fortunately, a car repair track came within a few feet of the freight room end of depot, and after the building

THE DEPOT BLOCKED UP

was raised the track was thrown about three feet to the center of the depot and extended underneath and beyond it a distance of 200 ft. to the new location of the building. When the depot had been jacked up, the crib work completed and the track extended, two 36-ft. flat cars were pushed under the building, which was then lowered onto them, being blocked up on old bridge stringers placed at right angles to the cars. One of the photographs shows the method of placing the stringers on the cars and also the extra blocking required under the freight room end, on account of the 2½-ft. raise in freight room floor. It required only about 60 seconds to push the depot to the new location with a locomotive, where the cribs were again placed, the cars removed and the building lowered to the new site.

Two days' time, with a crew of 16 men and a foreman, completed the job at a cost of $83, which included jack-

BLOCKED UP ON THE CARS

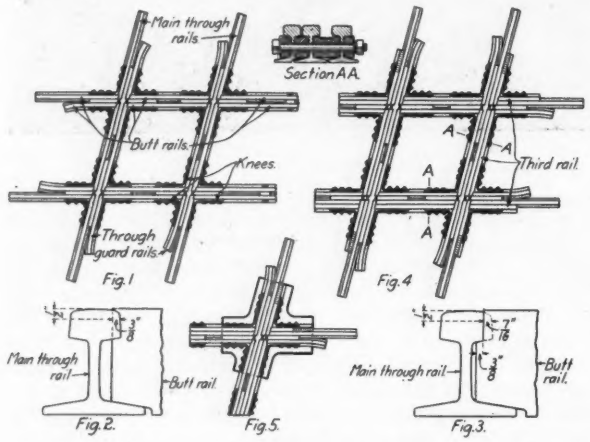
ing up, building and removing the temporary track, lowering, engine service, and the time of an experienced house mover who looked after the work. The building was moved with no interruption in telephone, telegraph or electric light service, and the agent and clerks only stopped work while the actual moving was taking place.

THE DESIGN OF RAILROAD CROSSINGS*

Principles Governing the Construction of This Detail of Track Work in Open Hearth and Manganese Steel

BY H. F. HEYL,
With Wm. Wharton, Jr. & Co., Easton, Pa.

WHERE one track crosses another openings must be provided in the rails through which the flanges of the wheels pass across them. The resulting special work is usually termed a "crossing." There are two main classes of construction for crossings —the so-called "plain bolted" and the "manganese steel" construction. These are again subdivided into the various types of single, double and three-rail. In manganese steel construction, cast manganese steel inserts are provided at the intersections, or the entire structure may be made of a solid manganese steel casting.



TWO-RAIL AND THREE-RAIL BUTT CROSSINGS

INFORMATION REQUIRED BY A MANUFACTURER

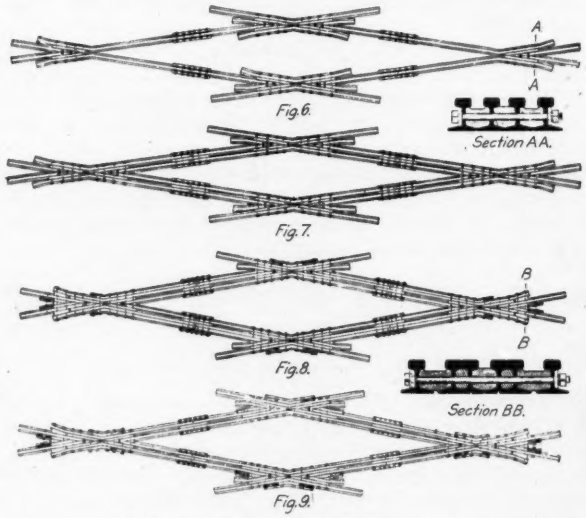
The following information is necessary for a manufacturer if he is to build a crossing. To avoid all misunderstanding as to where the angle is measured, the direction of curve, etc., a sketch showing the alinement of the crossing should be sent along with the inquiry or order.

(1) Class of construction ("plain bolted" or "manganese steel.")
(2) Type of crossing, whether single, double or three-rail.
(3) Rail section.
(4) Angle of crossing. The angle usually given is the angle between the center lines of the two tracks.
(5) Gages of the crossing.
(6) In case of two or more crossings, the distance between crossings is necessary.
(7) Degree or radius and direction of curve.
(8) Width and depth of grooves required, unless left to the judgment of the manufacturer.
(9) External arm lengths, unless to be made to manufacturer's standards.
(10) State which run is to have the through rails in the case of "plain bolted construction."
(11) Whether base plates are wanted—loose, riveted or clamped.
(12) Whether the crossing is to have fillers only where necessary for the bolting, or whether fillers throughout the entire length are desired; also whether there is any preference for cast-iron or rolled steel fillers.
(13) Drilling of rail—fish and vertical drilling.
(14) When compromise joints are wanted, give rail section and drilling of all connecting rails.

CONSTRUCTION OF PLAIN BOLTED CROSSINGS

By the term "plain bolted crossing" is meant a crossing constructed of tee-rails, in which the rails are properly planed and shaped and held together by knees, fillers and bolts. Crossings with angles between 90 deg. and 35 deg. are usually made "butt' crossings, so named because the rails on one track are shaped and planed to butt into the rails of the through track. Below a 35-deg. angle, crossings are usually made of the frog type.

Fig. 1 shows a "two-rail type" butt crossing. The rails in the track carrying the heavier traffic are made in one-piece rail lengths. At the intersections slots are planed through the head of the main and guard rails to allow the wheel flanges of the cars on the track having the butt rails to pass across. There are several ways of shaping the butt rails. The two methods most in use are shown in Fig. 2 and Fig. 3. In Fig. 2 the ends of the butt rails are shaped to follow the contour of the through rails, while in Fig. 3 the head of the main rail is notched about ⅜ in. to receive the butt rail. The latter method is also embodied in Figs. 1 and 4. It is preferable to use the first-named method, as it gives a better fit of the butt rails against the main rails, and the notch tends to keep them in better alinement. Fillers fitting into the fishing space of the rails and of proper width for the necessary flangeway are placed between the running rails and the guard rails. The butt rails are secured to the through rails of the other track by means of brackets or knees and bolts passing through the knees, rails and fillers.

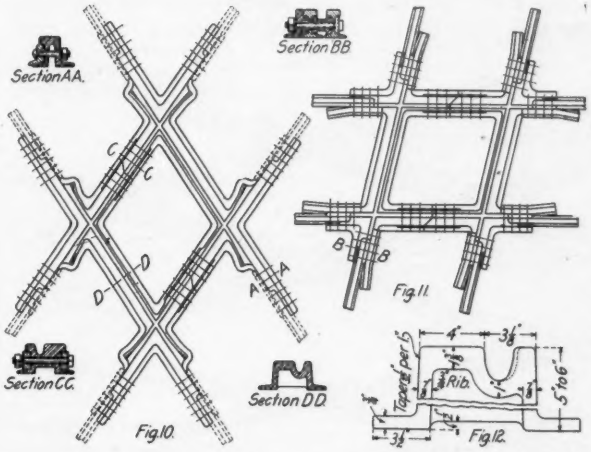


FOUR TYPES OF FROG CROSSINGS

These knees or brackets are usually made of either rolled steel straps, shaped to fit the fishing section of the rail, or forged out of bar-steel stock. The former are simply bent to the desired angle, while the latter, in addition to being bent, are reinforced in the corners where they fit

*The first article of this series, on "The Design of Special Track Work," appeared in the December issue, page 369; the second article, on "The Correct Design of Split Switches," in the January issue, page 13, and the third article, on "Standardizing the Design of Frogs," in the February issue, page 41.

into the angle of the crossing. In most cases they are 1½ in. thick. In crossings ranging from 90 deg. to 45 deg. it is the general practice to make them long enough to fasten them to the crossing by 3 bolts on each arm, as shown in Figs. 1 and 4. It is of the greatest importance that they have a snug fit in the fishing, so as to hold the rails properly together and prevent them from becoming



SOLID MANGANESE CROSSINGS OF 45 TO 90 DEG.

loose. They should be kept somewhat away from the web of the rail so as to allow tightening in case of wear.

Fig. 4 shows a "three-rail" type crossing. It is constructed in the same way as the "two-rail type," with the addition of the easer rail, sometimes called the third rail or the bearing rail. The easer-rail feature is to be recommended strongly, as it adds to the life of the crossing by helping to carry the false flanges of worn wheel-treads across the intersection. It is of prime importance that the easer rails be planed and coped to fit firmly on the base flanges of the running rails, as otherwise the easer rails are apt to get a vertical motion, resulting in the crossing becoming loose and rattling. Between the easer and the main rails short cast-iron or rolled-steel fillers are placed at each bolt (see section AA, Fig. 4). Some companies call for continuous rolled-steel fillers the entire length of the third rail. The latter method, while somewhat more expensive, adds to the rigidity of the crossing. The length of the easer rails on the external arms is variable, some companies holding them back inside of the joint, while others extend them half a joint ahead of the main rail. The latter method is preferable, as it protects the joint.

All crossing bolts should be of high tensile strength, such as are generally known as "heat-treated bolts." To get the best results, bolts should have a driving fit. The size of the bolts should be similar to that recommended for frogs—1⅜ in. in diameter for rails with a fishing section over 3⅜ in.; 1¼ in. in diameter for rails with a fishing section from 3 in. up to and including 3⅜ in.; 1⅛ in. in diameter for rails with a fishing section from 3 in. down to and including 80-lb. rails. Fillers should preferably be made of rolled steel, rolled to fit the fishing section of the rail.

All bolted crossings should have base-plates under the intersections in order to make the construction more secure. The style used depends upon conditions. Some companies call for continuous plates under both runs, while others require continuous plates under one run only. There are also riveted, clamped and loose corner plates. The continuous plates are placed under the track having the "butt" or separate rails. The clamped corner plates are perhaps the most reliable and should be preferred to the riveted corner plates because the bolts holding the clamps to the plate can be tightened on becoming loose and there are no holes to be drilled in the flanges of the rails. These extra holes tend to weaken the rail. Again, plates should not be designed too large, as otherwise it is almost an impossibility to tamp the ties properly. Some companies have overcome this objection by shearing the plates to special shapes (see Fig. 5). Needless to say, the latter method is somewhat more expensive.

FROG CROSSINGS

Figures 6, 7 and 8 show a single-rail, a double-rail and a three-rail crossing, respectively, of angles under 35 deg. Experience has shown that the acute angle to which the butt rails would have to be shaped makes it undesirable to apply that construction below 35 deg., for the head of the butt rail would form a thin, overhanging point. Therefore, the intersections for such low angle crossings are made in what is termed the "frog" style, with points formed of two rails bolted together. The frogs at the extreme ends are termed "end frogs," and the two in the center of the crossing "middle frogs," or sometimes "double-pointed" frogs. The former is the more appropriate to use, as an end frog may become double-pointed by the insertion of a guard-point, as shown in Figs. 7 and 8, whereas "double-pointed frog" really means a frog made of two main-line or running-surface points. A type of crossing which is very popular is the one shown in Fig. 9, which is a two-rail crossing with the addition of short easer rails at the approaches to all intersections. The short third rail can be applied similarly to the single-rail crossing shown in Fig. 6. As explained under "butt" crossings, this feature is to be recommended strongly.

When ordering a crossing a company can do no better than to order according to manufacturer's standards and to depend upon their methods of planing, shaping, coping and drilling rails, as they have standard jigs and templates to make these crossings considerably cheaper than if they had to be constructed to a company's detail which is at wide variance with the manufacturer's standard.

Grooves in straight crossings are generally made 1¾ in. wide and should be not less than 1¾ in. deep. On curves grooves have to be widened to suit the degree of curve and other conditions.

MANGANESE STEEL CROSSINGS

Manganese steel was first introduced in steam-road crossings in 1902 at a place where Bessemer steel cross-

FIG. 13—MANGANESE STEEL CENTER CROSSING OF 45 TO 90 DEG. ANGLE

ings lasted 6 months, parts of them being still in use in 1913. Since then hundreds of manganese steel crossings have been manufactured. There is no doubt but that they have proven their economy in most cases especially when the wear and tear, smooth riding and maintenance expenses are considered. The decision to use manganese steel crossings in preference to plain bolted

construction is governed by conditions and has to be decided by the engineer in charge.

The type of manganese steel crossing to be used also depends on conditions such as traffic, roadbed, the angle of the crossing, etc. The Manganese Track Society has gone into this subject very thoroughly and has recommended various styles of crossings for certain angle limits. A road can do no better than to order its manganese steel crossings by specifying "to be according to Manganese Track Society Standards." The company will then know exactly what it can expect and the manufacturer will know what the railroad company wants.

For angles from 90 deg. to 45 deg., inclusive, the Manganese Track Society recommends two types of solid manganese steel crossings, one made entirely of manganese steel, including the outside arms (Fig. 10), and the other with the outside arms made of rolled rails (Fig. 11). The latter particularly recommends itself when the outside arms have to be long, which when made part of the casting the arms increase the foundry difficulties and make the crossing considerably more expensive without any particular advantage. In both types the manganese steel part is made in two halves, as solid one-piece crossings have proven a too uncertain foundry proposition. Fig. 12 shows a section with figures recommended by the Manganese Track Society. It will be noticed that the tread or running surface is sufficiently wide to take care of the third or bearing-rail feature. The extended bearing rail is also taken care of.

It cannot be urged too strongly to allow the manufacturer to do the designing, so as to distribute metal properly in the manganese sections, as the majority of manufacturers have made a special study of this problem. It frequently happens that engineers not familiar with good manganese steel foundry practice design sections which cause segregation of the metal, cracks and other hidden defects, which are practically unavoidable in the casting and treating of manganese steel, with improperly proportioned sections, and which often cannot be detected by the most careful inspection until they develop under service in the track.

It will be noticed that the Manganese Track Society does not recommend a manganese steel center crossing for angles between 45 deg. and 90 deg. While this style

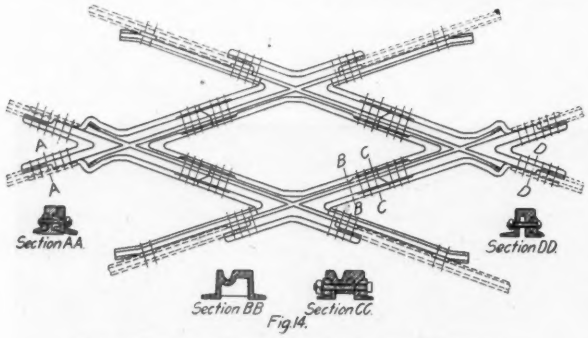


Fig. 14.

FOUR-PIECE SOLID MANGANESE CROSSING

of crossing is somewhat cheaper than the solid type with the rolled-rail arms (Fig. 11), the extra service secured from a solid manganese steel crossing is well worth the difference in cost. The manganese steel castings at the intersections are such that the rails between the intersections are extremely short and there are too many loose parts, which means extra maintenance expense. Figure 13 shows a typical manganese steel center crossing for this series of angles.

Between 45 deg. and 30 deg. the Manganese Track Society recommends both solid and manganese steel center crossings. The solid types are similar to the ones described above, excepting that on account of the length of the castings they are cast in four pieces (Fig. 14). In addition, rolled rail guard-rails are extended to protect the points of the end frogs. Figure 15 shows a typical three-rail manganese steel center crossing for this range of angle.

For angles between 30 deg. and 25 deg. a two-rail crossing with short third rails is recommended (Fig. 16), and

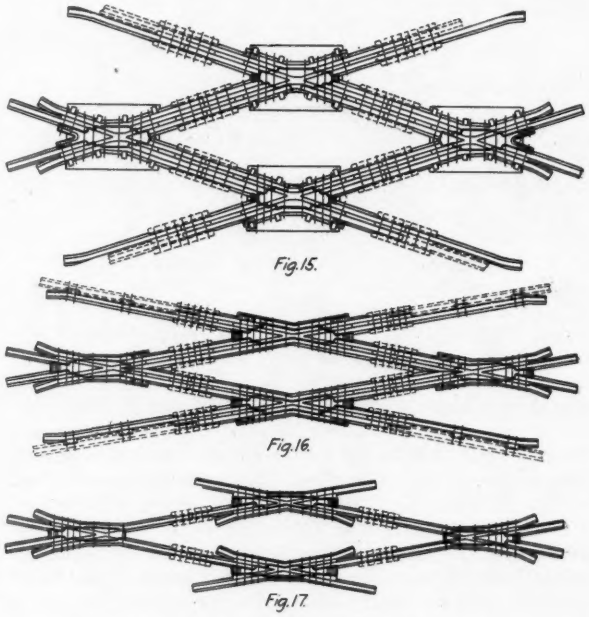


Fig. 15.

Fig. 16.

Fig. 17.

MANGANESE INSERT CROSSINGS

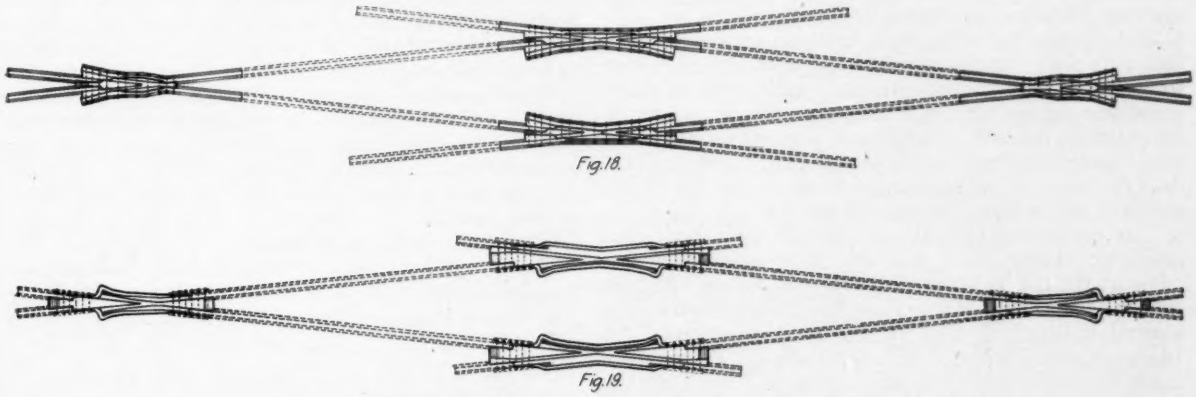
for angles between 25 deg. and 15 deg. a single-rail crossing with or without short third rails is recommended. Figure 17 shows a crossing without the third rails. For angles between 15 deg. and 9 deg. 30 min., both manganese center frog crossings (Fig. 18) and solid manganese steel frog crossings (Fig. 19) are recommended. If the crossings shown in Figures 18 and 19 are straight, the railroad need only order the four frogs, as the rails can be cut in by the railroads themselves. Crossings below 9 deg. 30 min. (No. 6 frog) are seldom made of rigid construction, but are usually provided with movable points. If any of the single-rail crossings are curved, a guard rail should be placed in the diamond of the crossing.

In connection with manganese steel crossings in general, a saving will result if, when ordering a crossing for a location having a very heavy and severe traffic, a duplicate set is ordered at the same time. This not only saves engineering expense, but also the cost of expensive patterns, which would most likely not be in existence when a new crossing was needed. This will more than pay for the interest on the investment, and will at the same time provide a second crossing for emergency cases.

The use of base plates under manganese steel crossings is optional and depends greatly upon conditions. Most of the larger companies order corner plates with all manganese steel center crossings, but plates under solid crossings are unnecessary, as the crossing itself is sufficiently rigid. Plates under manganese steel crossings should be fastened to the crossings by means of clamps and should not be riveted.

The length of the external arms in crossings is a point

which leads to a great deal of correspondence. Unless a company has standard plans of its own, the external arm lengths should be left to the discretion of the manufacturer. It happens frequently that the lengths called for are too short for the construction desired, and consequently the guard or third rails have to be shortened to such an extent in order to allow the proper bolting on



MANGANESE FROGS FOR ACUTE ANGLE CROSSINGS

of joint plates as to prove detrimental to the life of the crossing. At the same time they should not be made too long, as it sometimes happens that the long arm is broken off in loading or unloading.

In solid manganese steel crossings it is to the advantage of the railroad not to hold the manufacturer to any specified arm lengths, as the latter have methods of making these patterns to certain standard dimensions, which at the same time are the minimum arm lengths of the particular angles. Any deviation from these lengths not only means additional cost of metal, but also extra pattern work. This is especially true where a company calls for all existing joints to be met, which is many cases means a different length to each arm. It will readily be seen that this requires additional patterns and foundry expense. In solid manganese steel crossings short arms are desirable, not only to avoid unnecessary expense, but also to insure good, solid castings. Where the external arms of a crossing connect with a different rail section, necessitating compromise joints, a rail length of the same section as the crossing should be cut in before applying the compromise. In connection with manganese steel crossings it is particularly desirable to cut in a section of new rail adjoining the crossing to insure a good joint at the end of the crossing.

Some railroads have found it profitable to send worn manganese steel crossings back to the manufacturer for restoration and repairs, providing they are not too badly worn. In many cases, by fitting on new rails, bending up the castings in the middle and regrinding the surfaces, a manganese steel center crossing can be restored to good condition, giving considerable additional service.

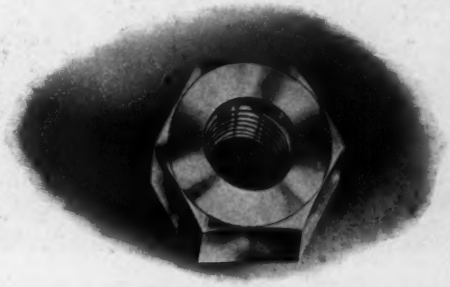
In recent years many companies have been using rolled manganese rails in their plain bolted crossings of the types described above. It is generally customary to make the main and easer rails of rolled manganese rail, leaving the others of open-hearth. Then again, there may be heavy traffic on one track and very light traffic on the other, in which case the rolled manganese rails need only be applied on the heavy-traffic run. Another advantage is that individual rails can be renewed without much trouble. Of course, at present it is almost an impossibility to get rolled manganese rail, and even in normal times only a few of the more popular sections are rolled. If the railroad desiring this style of construction does not have any of this rail as its standard, it will require compromise joints all around the crossing. On account of the hardness of the metal, it is very difficult to do any cutting or drilling in the field.

One of the most essential features to the life of any crossing, no matter what its construction may be, is a proper foundation. If a roadbed is not properly kept or drained, crossings will sag and creep. This not only tends to loosen various parts, but even tends to break them, not to speak of the unnecessary wear resulting. It can readily be seen that this causes unnecessary maintenance cost and that frequently crossings have to be renewed much sooner than if they had had good foundations.

Finally it cannot be emphasized too strongly to the designing engineer that he should avoid placing anything on plans that will be classified as special material, such as bolts, nutlocks, specially-shaped plates, special forgings or other material that is not of commercial sizes. As mentioned before, this means much unnecessary expense and long deliveries.

A ROLLER LOCK NUT

A NEW lock nut was recently placed on the market for which the advantages are claimed that it not only locks against loosening but tightens up with the vibrations occurring in service. This lock nut has the outward appearance of a plain nut, as the working parts are concealed from view in a recess covered with a flat ring on the outer end of the nut. The working parts consist of a small roller or flat disc attached to a band spring oc-



THE ROLLER LOCK NUT

cupying the annular space between the bolt and the walls of the recess in the nut. The little roller is placed so that it rolls between the threads on the bolt and a wedge shaped projection on the wall of the annular recess. The

direction of this projection is such that no resistance is offered to the turning of the nut in the direction of screwing on, either by hand or wrench. On the other hand, any tendency for the nut to move in the opposite direction causes the roller to jam between the threads on the bolt and the wedged-shaped projection on the nut.

To remove the nut a wrench is applied in the usual manner with the result that the roller is crowded over the summit of the projection into a small recess. The nut can then be turned off without difficulty.

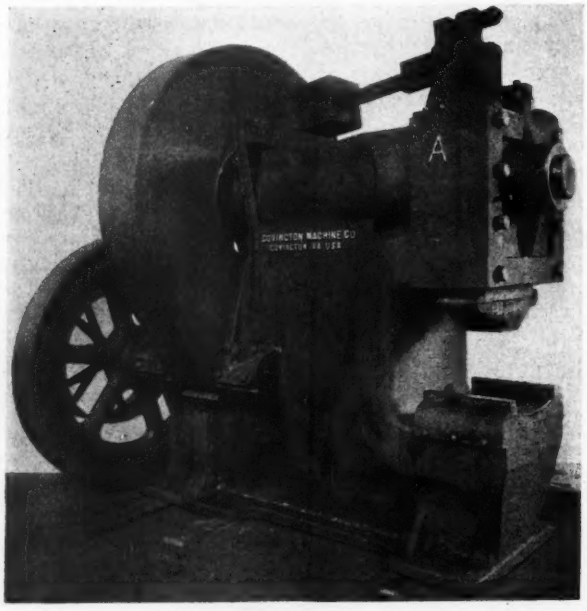
The principal advantages of this type of lock nut are that with any vibration or working in service it is free to tighten up, but cannot turn back, and therefore tends to become tighter with recurring vibration; it can be removed from the bolt by means of a wrench without injury, thus permitting its reuse repeatedly, and the bolt does not need to be any longer than one used with an ordinary nut without washer or nut lock.

This device has been in test service for a period of over two years. Two railroads have made extensive trials of the nut in track and tests are now in effect in tracks on the New Haven, the New York Central, the Central Railroad of New Jersey, the Pennsylvania, the Lehigh Valley and the Erie. This lock nut is manufactured by the Roller Nut Lock Company, New York.

AN OPEN THROAT RAIL BREAKER

THE Covington Machine Company, Covington, Va., has recently perfected an open throat rail breaker, which is claimed to have been found preferable for work of this nature to the guillotine shear frame type. The principal advantage of the new machine over the old is accessibility, it being very much easier to place a rail in position for breaking in the open throat machine than in the guillotine type.

As may be seen in the accompanying photograph, a steel head is mounted on the plunger and two removable bearing parallel guides, mounted in a cast steel block, are pivoted to the lower base of the machine jaw. The steel block is used to save the frame from deterioration, as it has been found from experience that the bearing parallels wear out rapidly and when mounted directly on the jaw of the main casting, break down the surface to which they are fastened.



THE COVINGTON OPEN THROAT RAIL BREAKER

Owing to the heavy shocks experienced in rail breaking, the main bearings for the eccentric shaft are made exceptionally large and are bushed with easily-removable bearings. The drive shaft is of babbit construction with caps and bolts.

To break the rail it is laid on its side on the parallels and a steel filler on the end of a metal handle is interposed by the operator between the rail and the plunger head. One stroke of the plunger is all that is required to break the rail.

These machines are preferably belt-driven as careless operators frequently allow the plunger head to jam, stopping the machine instantly. When once it stops it is impossible to complete the stroke without breaking some part of the machine. The belt drive is a safeguard against such careless operation. When motor driven, a friction drive is recommended.

The particular machine shown in the photograph is designed to break rails up to and including 100 lb. per yd. The machines are built, however, to handle any size rails desired.

HIGHLY OXIDIZED RED LEAD

BY G. W. THOMPSON
Chief Chemist, National Lead Company

THE use of red lead in the preparation of paints for the preservation of iron and steel dates so far back that it might almost be said that the "memory of man runneth not to the contrary." The red lead so used has varied greatly in composition, particularly as to the percentage of true red lead contained therein. True red lead has a formula of Pb_3O_4 and the percentage in red leads used for painting may vary from 70 per cent up to 100 per cent. Red leads which do not contain 100 per cent of true red lead are considered as mixtures of red lead and unconverted litharge, PbO, litharge being the material from which red lead is produced by oxidation.

Much progress has been made in the manufacture of red lead during the last 25 years. In general, the red leads have gradually increased in the percentage of true red lead present, and have generally become finer through better methods of grinding. These two ways in which red lead has improved in quality are closely related. It has been found that in most cases a red lead low in true red lead is comparatively coarse, the litharge present being found inside the coarse particles. By finer grinding the surface of the particles has been increased, thereby permitting higher oxidation and the consequently higher percentage of true red lead.

Two questions present themselves: Is a red lead containing a high percentage of true red lead best because of its containing less litharge or because of its physical qualities? In endeavoring to answer this question a number of samples of commercial red lead were tested by a system of classification by flotation, whereby we were enabled to determine the percentage of relatively coarse particles these red leads contained. These coarse particles we customarily call sandy lead, and they may be considered as in the main being composed of particles having a diameter greater than 0.0025 in. This figure has been obtained by microscopic measurement. The percentages of true red lead and coarse and sandy lead obtained on these samples are as follows:

True Red Lead	Coarse and Sandy Lead
95.16 per cent	1.90 per cent
92.21 per cent	11.34 per cent
90.10 per cent	17.76 per cent
88.21 per cent	21.62 per cent
82.53 per cent	28.72 per cent

These figures show that as a general rule the finer the red lead, the higher will be its content of true red lead. Of course, it is obvious that this is not a necessary condition. In the manufacture of red lead, litharge or its equivalent is subject to a temperature of about 900 deg. F., with an ample supply of air, and the usual custom of manufacturers is to carry this oxidation on as far as is practicable. They can, of course, draw out from the furnaces before this oxidation is complete, in which case, however, they would probably have a red lead which when rubbed out would show streaks due to the presence of unconverted litharge. It is possible also for a manufacturer of red lead to mix litharge with his red lead after having manufactured it. Neither of these conditions are found to exist commercially, and it is true that commercial red leads of an equal purity show a percentage of red lead corresponding to the fineness of the product.

Reverting now to the figure given above as the minimum diameter of the particles included in the class known as coarse and sandy lead, namely, 0.0025 in., and considering this in connection with the thickness of ordinary paint coatings, it becomes at once obvious why the highly oxidized and consequently fine red leads are superior for use in the making of paints for iron and steel. Paint coatings occupy space, that is, they have length, breadth and thickness.

The average thickness of a coating of paint for iron and steel may be 0.005 in. In many parts, however, the coating may easily reach a thinness of 0.0017 in. If, therefore, a paint contains particles whose smallest dimension is 0.0025 in. or greater, it is obvious that the particle will stand out in a paint coating where the thickness of the paint coating is 0.0017 in. Such coarse particles become, therefore, the weak point in the film, and corrosion may start around them. The paint film itself is weak at such points, as the coarse particle may not be completely encased in the oil of the film.

All this leads us to conclude that the superiority of a highly oxidized red lead is really due to its fineness. It is a better pigment. Its superiority, however, lies not only in the more continuous paint film it produces, but in its producing a better working paint, a paint that flows out well, but will not run, sag or weep.

So far as our accurate knowledge goes, we think litharge is not a necessary component of red lead to be used for paints for iron and steel. It may be that some have obtained better results when litharge is present in appreciable amounts. Litharge in itself may or may not be of advantage to red lead. The experience of the practical user of red lead is and must be the final test. If any user of red lead finds that litharge has been of advantage it is obvious that this litharge can be added to the highly oxidized red lead at the time it is used. If litharge is used in this way, it should be the very finest that is obtainable and the manufacturer should be expected to furnish the litharge on as rigid specifications as the red lead with which the consumer intends to mix it.

As to whether red lead containing litharge withstands the chemical action of the atmosphere—whenever we have exposed a paint composed of a highly oxidized red lead, it has kept its color longer than when a similar paint made from a low oxidized red lead has been similarly exposed.

We wish it to be understood that we are not condemning any form of red lead for the protection of iron and steel. We are simply pointing out that the highly oxidized kind is the best that can be made from the standpoint of protection to the iron and steel, ease of application, and all the other good qualities.

The Drainage of Railway Roadbeds

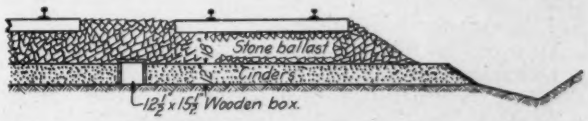
BY W. F. RENCH,
Supervisor, Pennsylvania Railroad, Perryville, Md.

IN the study of water pockets in embankments, the consideration of safety to traffic as well as of economy in maintenance is usually present. Disastrous slips of embankments have occurred even on roads that were comparatively old. A case is known in which many miles of an important trunk line were put out of commission following a 10-day period of continuous rainfall. When constant attention is necessary to maintain the surface at any particular spot, the cause is almost always the presence of a water pocket. Economy in the repairs requires that the trouble shall be corrected without delay.

By reason of the continual settlement taking place in fills, pipe drains are not usually practical. French drains, or blind drains filled with various sizes of stone, are much more effective. A trench to receive the drain leading upward to the bottom of the pocket is cut into the side of the embankment, or in special cases is cut entirely through the fill. The trench is of a sufficient size to drain the cavity, and is usually from two to three feet in width and at least five feet deep below the base of rail.

One-man stone is proper for filling the bulk of the drain, but it is sometimes an advantage to encompass the larger stone with broken stone of ballast size to serve as a filter for the surrounding soil. Care should be taken that a sufficient fall is provided, so that subsequent settling of the embankment will still leave a practical grade. If a considerable flow of water is caused a paved gutter may be necessary to lead the stream down the embankment without erosion. When the embankments are low and the adjacent ground flat a longitudinal drain may be required to receive and carry away the water. A pipe is not always practicable, and a French drain may be necessary for this also.

An accompanying photograph shows a French drain being installed in an embankment on the New York to Washington line of the Pennsylvania. The water pocket



CROSS SECTION OF CINDER DRAIN

had its axis across the roadway at an angle of 60 deg. with the center line. The stretch of road affected by the pocket was 50 ft. in length and included six joints which required tamping every few days. The placing of this drain has entirely cured the trouble. The detailed method of shoring the trench is shown in this photograph. The vertical shores are in sections that are readily knocked down and removed at the moment the stone filling is to be applied. Short laterals were installed in the center ditch to extend the influence of the drain. The cost of

installing the drain was $200, which, however, included no charge for the two cars of one-man stone used, as they had to be wasted from another operation.

Draining Level Track

In many parts of this country deposits of a red shale are found which becomes quite hard when dry, but puddle quickly when water is present. This soil, when forming the roadbed of a railroad carrying heavy or fast traffic, causes endless difficulty at every heavy rain or long continued period of moderate showers. This is especially the case on the New York division of the Pennsylvania through portions of the state of New Jersey. The speed over this line is exceptionally high, a uniform rate of 70 miles per hour being generally maintained. Under such conditions, it is essential that joints as low as ¼ in. be as few as possible. The former method of coping with the pumping track was to dig out the ballast the moment the red mud made its appearance. This was not only expensive in labor, but the road was rendered unsightly in spots by the piles of red clay awaiting loading.

It was felt that if the water could be intercepted before it reached the clay soil relief would be obtained. As an

A French Drain

experiment the track was raised to provide a blanket of cinders between the ballast and the clay bed. This was effective for a time, but as soon as the cinders became impregnated with the clay, which was in about two years, the trouble reappeared. It was then suggested that longitudinal drainage be obtained along the center line between tracks. A pipe layout was considered, but it was concluded that sufficient entrance for the water could not be had through the joints alone.

To overcome this objection a box drain was provided. A bottomless box 12½ in. by 15½ in. interior cross-section was constructed of creosoted lumber. The 2-in. by 6-in. planks forming the box were separated ½ in. and the sides were bored with many ½-in. holes. The box was placed just below the sub-grade, which was 18 in. below the bottom of the ties. The box was then on the same level with the 12-in. cushion of cinders, and received the water that seeped through the ballast and cinders, which was thus drained away before it had a chance to puddle the red shale sub-bed. A considerable stream was thereby collected and was discharged at proper intervals beneath the outer tracks into the side ditches.

Generally no attempt was made to obtain a greater fall for the drain than the grade of the road, which varied from level to 0.6 per cent. Where the grade was no less than 0.5 per cent the drain was fairly self-cleaning, but for lower gradients it becomes necessary to clean the drain, which is done in the winter while the track is frozen and other work is not so pressing. To facilitate this the top of the box is removable. The 15½-in. width of the box permits the use of a shovel to advantage. The dirt is loaded directly on a work train occupying one of the adjacent tracks. This system of drainage has given good results through a period of about 6 years. A cross-section of the standard roadway is shown with the drain added.

Draining Yard Tracks

By reason of the lesser degree of maintenance practicable for yard tracks, the matter of drainage is of almost as much importance as upon main line tracks. The presence of water at switches is a prolific source of accidents. Sometimes French drains have been laid parallel with ladder tracks and have afforded good results in drainage. It is occasionally necessary to build them between the tracks in a yard, in which case it is desirable to use ballast size stone for the top layer to avoid possible injury to trainmen.

In one case of a yard used largely for passenger switching movements no other scheme of draining was possible than sump holes. These were placed contiguous to the switches and were about 8 ft. deep and 5 ft. in diameter. Care was taken to have the top of the stone filling of ballast size. Where entrance to a storm sewer is practicable a system of tile drainage for yards is justified, even though a considerable first cost may be necessary.

Underdraining Sodded Banks

It has become the rather common practice on many lines to sod the slopes of cuts, both on new construction and along old roadbeds. Where springs occur in the slopes considerable difficulty is often experienced in getting the sod to remain in place. Not only is the frequent slipping of the new sod a source of expense, but the bare spots mar the good appearance of the remainder of the slopes. The remedy is found in a scheme for leading the water to the track ditches. This may be done most simply by means of cinder-filled trenches just beneath the sub-soil. These may be in the form of the letters "Y" or "W." Sometimes a "W" imposed upon a "Y" furnishes the proper design for the leaders. They seldom need to be of greater cross-section than 18 in. square. A 12-in. depth of soil covering the drains is sufficient for the cultivation of the sod.

REPAIRING MANGANESE TRACK WORK

By J. T. Bowser,
Queen & Crescent Route, Danville, Ky.

THE use of manganese steel castings for track appliances such as frogs or crossings has become quite general in tracks on which the density of traffic causes a rapidity of wear which justifies the greater first cost of this material as compared with the common rail construction. While the average life of these castings is usually all that can be expected under the conditions, there is an occasional loss due to failure or excessive wear at some one point on the casting, usually at the point of the frog and sometimes on the heel a short distance back of the point.

These failures are generally due to flaws in the casting and if they show up within a reasonable length of time after installation, the manufacturers will usually make some allowance for the failure. Where this allowance cannot be obtained, the casting is not necessarily a total loss, as has been shown by recent experiments with the Thermit welding process for building up the failed portions. In these experiments the welding material was

applied in the usual manner, and the weld was then milled off to a smooth surface with the balance of the casting. In the case of one frog, the repaired frog has been in use on a lead with comparatively heavy traffic for several months and the built-up portion shows no more wear than the balance of the frog.

Manganese castings for track appliances are also subject to failure through breakage. This may be due to a defect in the casting, insufficient or uneven foundation, or to accident. In such cases the impending failure is usually apparent before the break is complete, as cracks usually show up some time before the final failure. These breaks usually appear first in the base of the casting and it is therefore possible to repair them without removing the casting from the track. This is a particular advantage in the case of crossings since duplicates are not always kept on hand. For welding castings without removing them from the track the oxy-acetylene process seems to be more practicable since the apparatus is more readily portable.

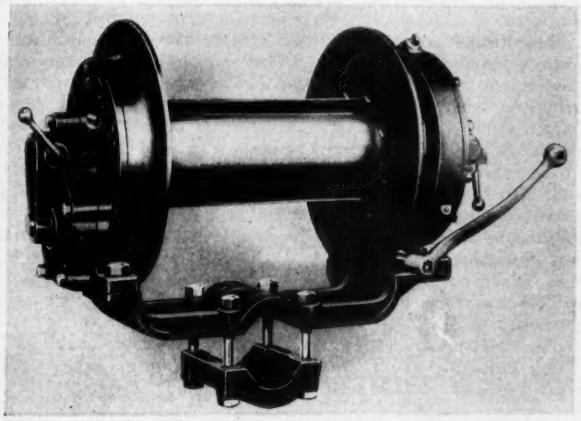
In making experimental repairs of this character the crack has been cut out in a wedge shape and this opening then built up with the welding metal. In these cases it will probably be found necessary to disconnect one joint temporarily to take care of expansion and contraction.

A NEW TYPE OF HOIST

THE Ingersoll-Rand Co., New York, has recently introduced a portable hoist for the use of those who prefer manila rope to wire rope for light hoisting and hauling. The hoist has a lifting capacity of 600 lb. and weighs less than 350 lb. completely equipped.

The hoist is 21½ in. long by 31¼ in. wide and 23 in. in height. The drum is 7 in. in diameter by 17 in. long with 5-in. flanges and accommodates 300 ft. of ⅞-in. manila rope. The base is so arranged that it may be clamped to a circular column or pipe and by removing the clamps can be readily bolted to any convenient support.

The square piston, reversible driving engine, drum release clutch and worm operated hand brake are essentially the same as in the earlier designs of hoists, the main differences being in the diameter and length of the drum, the width of the flanges and the main frame and over-all dimensions.



THE NEW HOIST

The hoist is built for operation either by compressed air or steam. Although designed primarily for underground work, it is adaptable for general hoisting, hauling and handling in mines, tunnels, quarries and industrial plants.

THE MATERIAL MARKET

THE most interesting phenomenon in the material market during the last two weeks has been the apparent lack of any particular influence of the current international crisis upon the prices of railway materials. There has been almost no advance in the steel market, only a nominal change in cement, and lumber is stationary. The steel manufacturers are complaining of the railroad congestion and intimate that material curtailments in production will be necessary unless there is an immediate improvement in the situation, whereby they can move their materials more freely.

The greatest activity among track materials has been in tie plates. The New York Central recently purchased about 6,000 tons and two other railroads have inquiries out for 14,000 tons and 6,000 tons, respectively. There have been no change in the prices of any track materials, although an advance in the price of track bolts is predicted. Tie plates are now $55 to $60 per ton, track spikes bring $3.50 to $3.60 per cwt., track bolts are quoted at 4.50 to 4.60 cents per lb. at Chicago, and 4.85 to 5. cents per lb. at Pittsburgh. Boat spikes are $3.65 per cwt. and wire nails $3 per keg, base price. The scrap market shows a weakening tendency, the price of scrap rails at Chicago having dropped off 50 cents about February 1. Five middle western roads are offering scrap which aggregates 10,000 tons, but the demand seems to be very weak.

A few rail orders are still being placed, though most of the buying seems to be over for the present. The Pittsburgh & Lake Erie has ordered 10,000 tons and the Northern Pacific, the Michigan Central, the Philadelphia & Reading and the Nickel Plate each ordered 5,000 tons. The United States government also recently ordered 10,000 tons of rails for the Alaskan Railway and is understood to be in the market for additional tonnage of about equal magnitude.

The structural steel shops have taken up considerable tonnages in recent orders, a fact which is borne out by moderate advances in plain materials. Shapes advanced at Chicago from a range of from 3.19 to 3.75 cents per lb. to a range of from 3.44 to 4.00 cents. The price quoted at Pittsburgh is 3.25 cents per lb., but as much as 3.75 cents is being received on small orders. Plates at Chicago have advanced recently from a range of from 3.79 to 4.25 cents per lb. to a range of from 3.94 to 4.50 cents. The railroads are furnishing but a relatively small proportion of the tonnage in structural steel orders. The largest contract in recent weeks was that of the Western Pacific for 900 tons. A contract for 3,000 tons for terminal developments at Jacksonville, Fla., is said to be pending.

The price of Portland cement advanced to the extent of 6 to 10 cents per barrel in several middle western cities early in February. These changes compensate for advances made further east during the month of January. As now quoted for carload lots, not including package, the price is $1.66 per bbl. at Chicago and Pittsburgh, $1.79 at Cleveland and Indianapolis and $1.93 at St. Paul and Minneapolis.

The price of lumber in most kinds and grades is about stationary and there are no indications of any material changes in the immediate future. Southern pine mills have orders on hand for about six weeks' production. Reports of the West Coast Lumbermen's Association show a current production about one-third less than normal. Advances have taken place in some localities. The markets for California white and sugar pine report increases of $1 to $1.50 per M. ft. b. m. and there has also been a slight advance on cypress.

GENERAL NEWS DEPARTMENT

THE CHICAGO & NORTH WESTERN has had no fatality in a passenger train accident for the last four years. During that period it carried 132,238,957 passengers.

THE TEXAS STATE RAILROAD COMMISSION has introduced a bill in the legislature empowering it to require railroads to abolish highway grade crossings. It is proposed that the cost of the change shall be borne equally by the railroads and the respective counties.

THE CIRCUIT COURT OF APPEALS, Eighth Circuit, holds that a railroad is not liable for an accident due to an unblocked frog, though it may be liable where a switchman caught his foot in a frog which had been blocked originally, but had been allowed to get out of repair.

THE AMERICAN RAILWAY ENGINEERING ASSOCIATION will hold an excursion to Gary, Ind., and Buffington, Ill., on March 23, 1917, the day following the annual convention which will be held in Chicago on March 20 to 22, inclusive. Visits will be made to the Gary steel works of the Illinois Steel Company, the Gary plant of the American Bridge Company and the plant of the Universal Portland Cement Company at Buffington.

THE PENNSYLVANIA RAILROAD is now collecting waste paper with great care and it is expected that the quantity saved in a year will bring about $22,500. Ten thousand burlap bags have been distributed to stations, shops and offices for the collection of waste paper, including newspapers left on trains. A baling machine has been installed at Pitcairn, Pa., which is baling at the rate of 1,500 tons annually. The Lehigh Valley has taken similar action and has installed seven baling machines.

THE ENID, OCHILTREE & WESTERN planned recently to take up that portion of its track which runs between Dalhart, Tex., and Wilcox, a distance of 13 miles; but the state secured an injunction, and under a decision just rendered by the State Supreme Court, the removal of the track is forbidden. The railway contemplated using the rails in the construction of another line from Higgins, Lipscomb county, to Ochiltree. Associate Justice Yantis, in the opinion, said that to remove the track to other counties for the purpose of use in the construction of another road, would be illegal under the statute.

THE LEHIGH VALLEY announces that it is making a thorough study of the possibilities and advantages of electrifying portions of its lines through the anthracite region, including the Wyoming division on the main line between Mauch Chunk and Pittston Junction, Pa., and the Mahanoy and Hazleton division, which is a branch line between Penn Haven Junction on the main line and Mount Carmel. The proposed electrification involves 83 miles of double-track main line and 62 miles of double-track branch line, or a total of 145 miles of double-track. These improvements if carried out will cost approximately $10,000,000, including locomotives.

THE RAILWAY STOREKEEPERS' ASSOCIATION, at a meeting of the executive committee, held in Chicago on February 12, arranged to hold the fourteenth annual convention at Chicago on May 21 to 23, inclusive. Committee reports will be presented on the handling of rail, the handling of cross ties, the reclamation of scrap and other subjects. Special attention will also be given to the proper handling of materials distributed along the line, supposedly for immediate use and representing an investment of millions of dollars. An elaborate report will also be presented on the handling of stationery. In addition, the committee is planning a number of interesting and novel features for the convention which will contribute materially to its success.

THE INTERSTATE COMMERCE COMMISSION has announced a hearing for the taking of testimony on the protest of the Texas Midland against the tentative valuation recently issued by the commission, to be held at the office of the commission in the Interstate Building, Kansas City, on March 5. The Interstate Commerce Commission has issued its tentative valuation report on the property of the Elgin, Joliet & Eastern. The Winston-Salem Southbound Railway has filed a protest against the commission's tentative valuation of its property, hearing on which is set for March 19. The commission will also hear the protests on the valuations of the New Orleans, Texas & Mexico and the Kansas City Southern properties at Washington on the same date.

N. M. RICE, second vice-president, St. Louis-San Francisco, has prepared a table showing that 52 per cent of the material purchased by the Frisco in 1915 will cost $3,350,532 more in 1917, or an increase of 119 per cent. The remaining 48 per cent of material purchased has increased 60 per cent in price. Such items as track bolts, if the same quantity were bought in 1917 as in 1915, would cost 185.7 per cent more. Gasoline would cost 172.6 per cent more. Continuous joints, if purchased in the same quantity in 1917 as in 1915, would require an additional expenditure of $152,432. Additional expenditures for track spikes would be $209,714 more than in 1915. Cast iron pipe would cost 200 per cent more, tie plates 145.3 per cent and common nails 85 per cent more. The same quantity of spring frogs if purchased in 1917 would cost 47.4 per cent more than what they cost in 1915, while the additional expenditures for the same quantities of switches would be $34,779.

THE CANADIAN GOVERNMENT is making practical use of its recent inventory of the "man power" of the country, through the National Service Board, by calling on hundreds of men capable of taking employment on the railways to relieve the present congestion of freight. The difficulty of moving coal, with other transportation tangles, has been found to be due largely to scarcity of locomotive enginemen and roundhouse mechanics. Through the National Service inventory, every Canadian has been required to give details of his calling and to answer the question: "Are you willing to take work elsewhere in Canada at the same pay if railway fare is paid?" To this, the reply was usually in the affirmative. The National Service Board found that thousands of workmen were not employed in lines in which they were most proficient and useful, and this was true of many hundreds of railroad men. Some of these men are now being summoned to live up to their written assurance.

THE PENNSYLVANIA RAILROAD reports that during 1916 employees saved more than $14,000,000 worth of the company's property from destruction by fire. The annual report of the insurance department, covering the lines east and west of Pittsburgh, shows that employees extinguished 385 fires before the arrival of the public fire companies. The total loss sustained in these fires was only $16,437, while the value of the property endangered was $14,526,481. Regularly organized fire brigades among employees extinguished 90 fires; 111 fires were extinguished by individual employees, and locomotive fire apparatus was instrumental in checking 23 fires. The total number of fires, which occurred on property of the road in 1916, was 840, or 189 less than in the preceding year. The total fire loss amounted to $1,782,750, of which $1,376,879 was due to two exceptionally large losses, the grain elevator at Canton, Baltimore, which burned June 13, 1916, and the elevator at Erie, which was destroyed on December 10, 1915.

THE WEBB BILL to permit exporters engaged in foreign trade to establish joint foreign selling agencies, which has been passed by the House and is one of the measures on the administration legislative program, was reported favorably by the Senate Committee on Interstate Commerce on February 9, with some amendments designed to make certain that such agencies shall not be given any opportunity to violate the anti-trust law as applied to domestic business or to "artificially and unduly enhance prices within the United States." The advocates of the bill are having some difficulty in the effort to bring it to a vote. The Chamber of Commerce of the United States has issued a statement saying that the bill has reached a critical stage because of the short time left before the expiration of the present session of Congress and has issued a country-wide appeal to its affiliated members to bring pressure to bear to secure a vote on the bill.

PERSONAL MENTION

GENERAL

H. J. MOORE, division engineer of the Atchison, Topeka & Santa Fe, with office at Arkansas City, Kan., has been appointed general inspector of transportation, eastern lines, with headquarters at Newton, Kan.

CHARLES E. JOHNSTON, chief engineer of the Kansas City Southern, at Kansas City, Mo., has been appointed general manager, with the same headquarters. He began railroad work in 1897, as a chainman on railroad location in southern Illinois From that time until June, 1909, he held various positions in the engineering departments of the Chicago & Eastern Illinois, the Missouri Pacific, the St. Louis-San Francisco, the Kansas City Southern and the St. Louis Southwestern. On that date he was appointed division engineer of the Kansas City Southern, with headquarters at Mena, Ark., in charge of company forces employed in reconstruction work. He continued in that position until January 1, 1911, when he was appointed chief engineer, with headquarters at Kansas City.

ENGINEERING

FRANK HELM has been appointed division engineer of the Atchison, Topeka & Santa Fe, with office at Slaton, Tex., a newly-created position.

M. P. NORTHAM, office engineer of the Southern at Washington, D. C., has been appointed supervising engineer, with headquarters at the same point.

C. M. THOMPSON has been appointed division engineer of the Colorado division of the Union Pacific, with headquarters at Denver, Colo., succeeding George F. Davis.

C. B. CLEGG has been appointed acting division engineer of the Pecos division of the Atchison, Topeka & Santa Fe, with office at Clovis, N. M., succeeding J. W. Walter.

C. B. MAUTZ, assistant engineer of the Chicago & Eastern Illinois, in charge of new construction work at Danville, Ill., has resigned to go into business for himself at Johnson City, Ill.

C. M. RATLIFF, assistant engineer of maintenance of the Southern Railway at Washington, D. C., has been appointed office engineer of the Southern Railway System, with the same headquarters.

R. S. CHARLES, engineer maintenance of way of the Detroit division of the Wabash, with office at Montpelier, Ohio, has been appointed engineer maintenance of way of the Peru division, with headquarters at Peru, Ind.

L. W. DUFFEE, chief engineer of the Meridian & Memphis, at Mobile, Ala., has been appointed special engineer of the Gulf, Mobile & Northern, formerly the New Orleans, Mobile & Chicago, with the same headquarters.

J. W. BURT, engineer maintenance of way of the Michigan division of the Cleveland, Cincinnati, Chicago &. St. Louis, at Wabash, Ind., has been appointed engineer maintenance of way of the Chicago division at Indianapolis, succeeding R. Ferriday, resigned. C. W. Engle has been appointed engineer maintenance of way of the Michigan division, succeeding Mr. Burt.

O. L. VANDAMENT, assistant engineer of the L. C. & L. division of the Louisville & Nashville, with headquarters at Louisville, Ky., has been transferred to the office of the chief engineer, succeeding J. C. Haskins, resigned, to go with Roberts & Schaefer Co., Chicago, effective February 12. J. E. Scott, assistant engineer of the M. & M. division, with headquarters at Montgomery, Ala., has been transferred to Louisville, to succeed Mr. Vandament.

M. J. CONNERTON, roadmaster of the Queen & Crescent at Danville, Ky., has been appointed engineer maintenance of way of the Southwest district of the Southern Lines West, with headquarters at Chattanooga, Tenn. His jurisdiction includes the lines from Cincinnati, Ohio, to New Orleans, La., inclusive, the main line of which comprises the Cincinnati, New Orleans & Texas Pacific, the Alabama Great Southern and the New Orleans & Northeastern.

W. K. WALKER, assistant engineer on the Wabash at Ft. Wayne, Ind., has been appointed engineer maintenance of way, with headquarters at Montpelier, Ohio. He was born at Clinton, Ky., in August, 1881. He graduated from the Mississippi Agricultural and Mechanical College in 1902, and on July 1, 1903, entered railway service with the Yazoo & Mississippi Valley as a track apprentice and chainman at Greenville, Miss. From March, 1905, to March, 1907, he was assistant engineer on the Missouri Pacific at Pueblo, Colo., and from March, 1907, to March, 1908, was roadmaster, with headquarters at Geneseo, Kan. In October, 1908, he was appointed division engineer at Wichita, Kan., and in January, 1913, became assistant engineer in the division of valuation of the Interstate Commerce Commission, with office at Kansas City, Mo. In July, 1916, he was appointed assistant engineer in charge of improvement work for the Wabash at Ft. Wayne, Ind., which latter position he held at the time his present appointment, as noted above, became effective. He succeeds R. S. Charles, transferred to Peru, Ind.

W. K. WALKER.

THOMAS BERNARD, assistant to the chief engineer maintenance of way and structures of the Southern, with headquarters at Greensboro, N. C., has been appointed engineer of surveys, with headquarters at Washington, D. C. He has been in the continuous employ of this road since 1882, since which time he has served as assistant engineer, roadmaster, superintendent of tracks, bridges and buildings, engineer maintenance of way and assistant to the chief engineer maintenance of way and structures.

HUGH B. HOLMES, resident engineer of the Kansas City, Mexico & Orient, at Kansas City, Mo., has been appointed chief engineer, with headquarters at Kansas City. He was born on July 13, 1875, at Ferris, Ill., and after leaving high school he attended commercial college, also the Iowa City academy and the State University of Iowa. In 1899 he began railway work as a rodman on construction work with the Chicago, Burlington & Quincy. The following year he entered the service of the Kansas City, Mexico & Orient as topographer on preliminary surveys in the state of Chihuahua, Mexico. He subsequently served as levelman and transitman on location surveys of the same company. In 1904 he was appointed resident engineer on construction for the first section of about 12 miles of the La Junta-Temosochic extension of the Chihuahua & Pacific, now a part of the Mexico North Western. In 1905 he returned to the service of the Kansas City, Mexico & Orient as chief clerk and assistant to the superintendent of construction at Chihuahua, Mex., remaining in that position until 1909. He then served for one year in Texas, and later was transferred to the chief engineer's office of the same

HUGH B. HOLMES.

company at Kansas City as chief clerk. In 1912 he was appointed resident engineer in charge of the engineering department by the receivers. He served in that capacity through the receivership, which terminated in 1914, and with the new company in the same capacity until his appointment on February 1, as chief engineer of the same road, with headquarters at Kansas City, as above noted.

TRACK

J. E. CONNOLLY, acting roadmaster of the Marysville district of the Southern Pacific, with office at Marysville, Cal., has been appointed roadmaster, with the same headquarters.

G. E. FORREST has been appointed district roadmaster of the Texas & Pacific, with headquarters at Donaldsonville, La., succeeding G. L. Moody, transferred to this company's New Orleans terminals.

B. E. NUTLEY has been appointed roadmaster on the Second district of the Pasco district of the Northern Pacific, with headquarters at North Yakima, Wash., succeeding Fred Browne, temporarily assigned to other duties.

C. WHITFIELD, general roadmaster of the Colorado Lines of the Denver & Rio Grande, with office at Denver, Colo., has been appointed general roadmaster of the Minneapolis & St. Louis, with headquarters at Minneapolis, Minn.

J. R. STAM, assistant supervisor of Sub-division No. 1, of the Philadelphia terminal division of the Pennsylvania Railroad, with headquarters at West Philadelphia, has been transferred to Sub-division No. 3, with headquarters at Lancaster, Pa.

JOHN MCDOUGAL has been appointed acting roadmaster of the second subdivision of the Montana division of the Northern Pacific, with headquarters at Livingston, Mont., succeeding John Nordquist, granted leave of absence on account of illness.

P. H. HAMILTON, general foreman, St. Louis-San Francisco, Memphis, Tenn., was appointed safety inspector, effective February 1. He will give his attention to the promotion of safety in the maintenance of way department over the Frisco System.

J. O. HEAP, supervisor on the Pennsylvania Railroad at Altoona, Pa., has been transferred to the Philadelphia terminal division. James M. Kinkead, supervisor, at Huntington, Pa., has been transferred to Altoona to succeed Mr. Heap. J. W. Kennan, supervisor at Millersburg, Pa., succeeds Mr. Kinkead.

H. HAGERTY was appointed supervisor in charge of the third district of the Delphos division of the Cincinnati, Hamilton & Dayton, with headquarters at Ottawa, Ohio, on January 31, succeeding M. H. Beard, appointed assistant supervisor in charge of the Baltimore & Ohio yards at Chicago Junction, Ohio.

E. O. BUFFMIRE was appointed roadmaster on the Illinois division of the Chicago, Milwaukee & St. Paul, in charge of the line between Chicago, Ill., and Savanna, and with headquarters at Elgin, Ill., on February 14, 1917. He succeeds W. H. Kofmehl, who resigned a short time ago to enter the railway supply field.

F. C. HANNEMAN, roadmaster on the Great Northern at Great Falls, Mont., was transferred to Spokane, Wash., to succeed F. W. Stiles, deceased, on March 1. U. Sowa, roadmaster at Marcus, Wash., succeeded Mr. Hanneman at Great Falls. T. Connors, assistant roadmaster on the Butte division, with headquarters at Clancy, Mont., was promoted to roadmaster at Marcus, Wash., to succeed Mr. Sowa.

L. E. WILT, assistant supervisor of the Pennsylvania Railroad at Tyronne, Pa., has been transferred to East Liberty, Pa., A. W. Duke, assistant supervisor at Osceola, Pa., succeeds Mr. Wilt. G. L. Gressitt, assistant supervisor of subdivision No. 34 of the Bellwood division of the Pennsylvania Railroad at Iwona, Pa., has been transferred to subdivision No. 5 of the Williamsport division, with headquarters at Watsonton, Pa.

A. L. FERGUS, announcement of whose appointment as track supervisor on the Chattanooga division of the Nashville, Chattanooga & St. Louis was made in these columns last month, first entered railway service with the Louisville & Nashville in 1907 as a rodman. From that time until he passed consecutively through the grades of transitman, masonry inspector, assistant resident engineer and assistant engineer. In 1915 he entered the employ of the Nashville, Chattanooga & St. Louis as assistant engineer, and was later office engineer and then assistant division engineer, which latter position he held at the time his present appointment became effective.

W. T. SMITH, general foreman in the maintenance of way department, has been appointed supervisor of a newly-created subdivision of the Michigan division of the Pittsburgh, Cincinnatti, Chicago & St. Louis, with headquarters at Logansport, Ind. He was born in Clinton County, Ind., March 18, 1884, and shortly after leaving school he entered railway service with the Vandalia as a track laborer in August, 1901. In April, 1904, he was promoted to section foreman and in January, 1905, he was advanced to extra gang foreman. He was appointed general foreman January 1, 1916, which latter position he held at the time his present appointment as supervisor became effective.

BRIDGE

H. L. FORNEY, carpenter foreman on the Pittsburgh division of the Baltimore & Ohio, has been promoted to master carpenter of the Pittsburgh division of the Baltimore & Ohio, with headquarters at Pittsburgh, Pa., succeeding W. M. Clark, deceased.

WENDELL P. BALL, assistant engineer in charge of the construction of second track on the Cincinnati, Hamilton & Dayton, between Middletown, Ohio, and South Dayton, was appointed to the newly-created position of district bridge inspector on January 22. He will have charge of the inspection of bridges on the Cincinnati, Hamilton & Dayton and the Northwest district of the Baltimore & Ohio.

PAUL B. LUM, assistant engineer of the Southern at Washington, D. C., has been appointed to the newly created position of structural engineer, where he is in charge of structural work in the office of T. H. Gatlin, assistant to the vice-president at Washington, D. C. Mr. Lum entered railway service with the Lake Shore & Michigan Southern, and subsequently was employed by the American Bridge Company at its Pencoyd plant. He entered the employ of the Southern as an assistant engineer in 1908.

OBITUARY

JOHN HENDERSON, roadmaster of the Grand Trunk, with headquarters at Belleville, Ont., died suddenly on January 14, of paralysis.

W. M. CLARK, master carpenter of the Baltimore & Ohio at Pittsburgh, Pa., was killed by being struck by a train while on inspection on January 1.

F. W. STILES, general roadmaster of the Great Northern, with headquarters at Spokane, Wash., died in that city on February 17, as the result of injuries suffered when he was struck by a falling derrick boom at Highland, Wash.

OLIVER HOWELL CRITTENDEN, chief engineer of the International & Great Northern, died at his home in Houston, Texas, on January 27, after a brief illness. He was born at Notasulga, Ala., on February 20, 1861, and received his engineering education at the Agricultural and Mechanical College, Auburn, Ala., from which he graduated in 1881. Shortly after leaving school he entered the engineering department of the Louisville & Nashville. From this time until 1897 he was engaged consecutively in location and construction work for the Queen & Crescent, the Illinois Central, the St. Louis-San Francisco and the Seaboard Air Line. In 1897 he became a locating engineer of the Kansas City Southern and later was promoted, in turn, to roadmaster, engineer maintenance of way, division superintendent and superintendent of bridges and buildings. In April, 1902, he became assistant engineer of the International & Great Northern and in November, 1905, he was appointed chief engineer.

O. H. CRITTENDEN.

CONSTRUCTION NEWS

THE ATLANTIC COAST LINE has awarded a contract to the A. M. Walkup Company, Inc., Richmond, Va., to build a brick passenger station on York street, Norfolk. The building will be two stories high, 48 ft. wide and 132 ft. long. Work will be started at once.

This road and the Norfolk Southern have filed plans with the Corporation Commission of North Carolina for a union passenger station at Kinston, N. C. The structure, which is to be built on Caswell street, will be of brick construction, one story high, 32 ft. wide and 134 ft. long.

THE BALTIMORE & OHIO plans to build a 2-mile line from Sago, W. Va., to a connection with the Coal & Coke Railway at Hampton, which will cost about $100,000.

THE BELLE FOURCHE & NORTHWESTERN has completed preliminary surveys for an extension from Belle Fourche, S. D., to Miles City, Mont., a distance of about 200 miles. It is planned to begin construction in the spring.

THE BRYAN & CENTRAL TEXAS plans soon to award contracts for an extension of its line from Bryan, Tex., through Stone City, Pittsbridge and Myers to Wittaker, a distance of about nine miles.

THE BURLINGTON, SOUTH CHICAGO TERMINAL RAILROAD recently incorporated with a capital of $1,500,000 to build from One Hundredth street, Chicago, Ill., southwesterly 10 miles to the city limits. The incorporators are officers of the Chicago, Burlington & Quincy.

THE CANADIAN NORTHERN plans to start work about February 15 on a temporary station at Lagauchetiere street, Montreal, Que. The structure will be of brick and terra cotta construction with stucco finish, two stories high, 106 ft. wide and 135 ft. long, and will cost about $150,000.

THE CHICAGO, BURLINGTON & QUINCY has requested bids on grading and hauling material for a line between Moberly, Mo., and Monroe City, a distance of 46 miles. The work involves 3,500,000 cu. yd. of embankment and excavation, a maximum grade westbound of 0.4 per cent and eastbound of 0.3 per cent, and maximum curves of one degree. A 600-ft. steel trestle will be built over the Salt river, near Stoutsville. A bridge of about the same length and of similar construction will be built over the middle fork of the Salt river, near Holliday.

THE CHICAGO, MILWAUKEE & ST. PAUL is making preliminary surveys for a proposed extension from Amidon, N. D., to New England.

THE CLINTON & OKLAHOMA is making preliminary surveys for an extension of its line from Clinton, Okla., to Colony, a distance of about 7 miles.

THE COLORADO, KANSAS & OKLAHOMA has made preliminary surveys for an extension of its line from Scott City, Kan., to Forgan, Okla., and construction will be started some time this year.

THE ELGIN, JOLIET & EASTERN has awarded a contract to the Great Lakes Dredge & Dock Company, Chicago, Ill., to reinforce the masonry supporting its bridge over the Grand Calumet River at Chicago, and work will be started at once. The cost of this undertaking will be approximately $80,000.

THE GREAT NORTHERN plans to enlarge its yard at Hillyard, Wash., which work will include the addition of five tracks 4,000 ft. long.

THE ILLINOIS CENTRAL has completed surveys for an extension from Dawson City, Ky., to Providence, a distance of about 17 miles. The new line will serve the towns of Charleston, Beulah and Dalton.

THE JACKSONVILLE TERMINAL COMPANY plans soon to open bids for the construction of a new union passenger station to be built at Jacksonville, Fla. The terminal will be located on Lee street at West Bay street and will cost about $1,000,000.

THE KEWANEE & EASTERN has been granted a charter by the Public Utilities Commission of Illinois to build a new line from a point in Rock Island County, Illinois, opposite Muscatine, Ia., through Kewanee, Ill., to a point near Streator, Ill., a distance of 120 miles. At present, however, only the line from Kewanee to Henry Junction, a distance of 42 miles, is planned. Contracts for this undertaking will be let in the spring.

THE LOS ANGELES & SALT LAKE is building a line from Pico, Los Angeles County, California, through Whittier, Fullerton, Orange County and Anaheim, to Santa Ana, a distance of about 25 miles. The contract for the grading was awarded to R. Sherer & Co., Los Angeles, while the track laying and bridge work is being done by company forces. The work involves a maximum curvature of 10 degrees, and a maximum grade of 1.5 per cent.

THE MIDLAND & NORTHWESTERN is about to start track laying on its extension from Midland, Tex., to Seminole, Okla., a distance of about 65 miles. This work has been at a standstill for some time, but conditions are now such that it is expected the line will be rushed to completion by May 1.

THE MISSISSIPPI & WESTERN, which has been granted a charter in Mississippi, plans soon to start work on a line from Stevens, Miss., on the Gulf, Mobile & Northern, to Paulding, a distance of about 18 miles.

THE NEW YORK CENTRAL plans to construct a double track cut-off 20 miles long around Albany, N. Y., which will avoid the necessity of hauling freight through that city and up a heavy grade at West Albany. This line will involve the construction of a high bridge across the Hudson River and will cost approximately $20,000,000. It will connect the West Shore and the Mohawk division of the New York Central west of Albany with the Hudson division of the New York Central and the Boston & Albany south of that city. The maximum grade will be 0.6 per cent as compared with 1.75 per cent on the present line.

THE OREGON-WASHINGTON RAILROAD & NAVIGATION COMPANY will construct an addition to its coach and boiler shops, approximately 180 ft. by 150 ft., at Pocatello, Idaho. It is also planned to lengthen 15 stalls in the present engine house from 82 ft. to 96 ft.

THE OSAGE COUNTY & SANTA FE has just located a line between Owen, Okla., on the Bartlesville branch of the Atchison, Topeka & Santa Fe, and Fairfax, on the East Oklahoma branch, a distance of about 65 miles. The construction of this line will involve heavy grading work and considerable bridging.

THE OZARK & ARKANSAS MIDLAND, a new company, incorporated with a capital of $750,000, of which about $250,000 has already been subscribed, plans to construct a line from Rogers, Ark., to Kingston, a distance of about 40 miles. It is planned eventually to continue the line to Bald Knob, Ark., about 125 miles, and with this in view, the line operated by the Ozark Land & Timber Company from Monte Ne, Ark., to Piney, a distance of eight miles, has been acquired. The line will connect with the St. Louis-San Francisco at Rogers.

THE PENNSYLVANIA has awarded a contract to Henry Steers, Inc., New York, to build a car repair yard at Greenville, N. J.

It has awarded a contract to the James McGraw Company, Philadelphia, Pa., to construct two concrete bridges over the Delaware & Raritan Canal, at a cost of $150,000.

This road plans soon to award contracts for the piercing of one 300-ft. and one 350-ft. tunnel on the Wheeling Coal Railroad, at points 5 miles and 8 miles, respectively, from Elm Grove, Pa.

This road is also enlarging its freight yard at Steelton, Pa., at a cost of $200,000.

It plans to build a one-story warehouse, 40 ft. wide by 200 ft. long, at Thomas street, Baltimore, Md. The office portion of the building will be of brick, while the warehouse will be of steel with asbestos-protected metal siding, steel rolling doors, slag roof, cement floors and concrete trucking platform parallel with the track nearest the warehouse. The entire track layout at this location will also be revised.

THE PERE MARQUETTE is contemplating the erection of a water station at Lansing, Mich., with an electrically-driven pump, drawing water from a lake one-half mile distant. The cost of this station complete will be about $7,500.

THE PHILADELPHIA & READING has awarded a contract to Seeds & Derham, Philadelphia, Pa., to build a reinforced concrete bridge over Jordan Creek and a public highway at a point east of Guth, Pa., on the Catasauqua & Fogelsville line. The work includes the construction of three 33-ft. concrete arch spans. The bridge will have a total length of about 350 ft.

THE PORT ANGELES & GRAYS HARBOR, a new company, incorporated under the laws of the state of Washington, plans soon to construct a new line from Port Angeles, Wash., to Grays Harbor, a distance of 130 miles. The cost of this work is estimated between $4,500,000 and $5,000,000.

THE ST. LOUIS, IRON MOUNTAIN & SOUTHERN contemplates the erection of a frame car repair shop at Argenta, Ark., soon, to cost approximately $20,000. No improvement beyond this has been planned for in the near future.

THE SOUTHERN, the Alabama Great Southern, the Seaboard Air Line, the Louisville & Nashville and the city officers of Birmingham, Ala., are negotiating for the construction of a viaduct over their tracks on Twenty-first street, Birmingham, Ala. While no contracts have yet been made, it is understood that the work will be carried on under the direction of the Southern Railway engineers. The cost of the work is to be paid jointly by the several railroads and the city.

THE UNION PACIFIC has awarded a contract to the Ziegler Bros. Construction Company, Junction City, Kan., to erect a one-story passenger station at Grand Island, Neb. The structure will be 74 ft. by 294 ft., and of brick and stone construction with concrete foundation.

THE WINCHESTER & WESTERN has awarded a contract to the Inter Mountain Construction Company to build a line from Winchester, Va., through Gainsboro, Gore, Rock Enon Springs and Capon Springs, W. Va., to Wardensville, a distance of 35 miles. The line is being built to carry iron ore and lumber.

THE YAZOO & MISSISSIPPI VALLEY, in connection with the Missouri & North Arkansas, will open bids about March 1 for the erection of a new combination passenger and freight station at Helena, Ark. The estimated cost of this building is $50,000.

STRUCTURAL STEEL

THE NORTHERN PACIFIC has ordered 1,570 tons of steel from the American Bridge Company.

THE PENNSYLVANIA RAILROAD has ordered 325 tons of steel from the American Bridge Company for three bridges at Altoona, Pa., and McGees, and one other point.

THE ST. LOUIS-SAN FRANCISCO has ordered 518 tons of steel for its Big Warrior Bridge, near Cordova, Ala., from the Virginia Bridge & Iron Works.

THE WESTERN PACIFIC has ordered 900 tons of steel from the McClintic, Marshall Company for three 200-ft. riveted spans and one 60-ft. through girder span at Sacramento, Cal.

TRACK MATERIALS

THE ALASKAN ENGINEERING COMMISSION has ordered 10,000 tons of rails from the Illinois Steel Company for the government railroad in Alaska.

THE FRENCH GOVERNMENT is negotiating for 150,000 tons of heavy section rails and 20,000 tons of medium section rails.

THE MICHIGAN CENTRAL has placed an order with the Carnegie Steel Company for 5,000 tons of rails for 1917 delivery.

THE PHILADELPHIA & READING has ordered 5,000 tons of rails from the Bethlehem Steel Company.

THE SOUTH AFRICAN GOVERNMENT RAILWAYS have ordered 4,000 tons of rails from the United States Steel Corporation.

THE WHEELING & LAKE ERIE has ordered 5,000 tons of rails from the Carnegie Steel Company.

SUPPLY TRADE NEWS

PERSONAL

H. M. GREEN has been appointed sales representative of the Barrett Company, with headquarters at Pittsburgh, Pa.

F. LLOYD MARK has been appointed western sales manager of the Stroh Steel Hardening Process Company of Pittsburgh, Pa., with office in the Monadnock block, Chicago, Ill.

FRED S. HILAND, formerly with the Patton Paint Company, Milwaukee, Wis., has been appointed a railroad representative for the Wadsworth-Howland Company, Chicago.

J. C. HASKINS, assistant engineer in the office of the chief engineer of the Louisville & Nashville, has resigned to go with the Roberts & Schaefer Company, Chicago, Ill.

JOHN M. TREVOR, manager of the concrete mixer department of the Chain Belt Company, Milwaukee, Wis., has been appointed representative of the same department of this company at New York City.

GENERAL

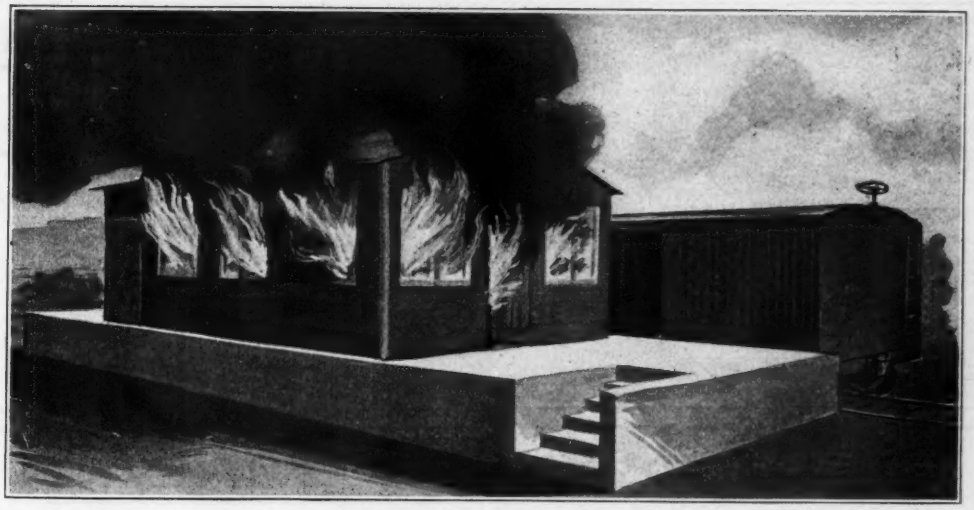
WARREN, CORNING & CO., Chicago, have been appointed selling agents for the Pittsburgh Shovel Company, in charge of the railway field.

THE BERGER MANUFACTURING COMPANY, Canton, Ohio, announces the appointments of R. W. Van Horn as head of the building material products' division, Norman A. Hill as efficiency engineer, P. V. Stonerod as head of the sidewalk light department, and A. H. Bromley, Jr., as chief engineer of the sales department.

J. LEONARD REPLOGLE, who, with his associates, recently purchased control of the Wharton Steel Company, has been elected chairman of the board. Other officials are: H. S. Endsley, president and treasurer; I. Townsend Burden, vice-president; Ernest Hillman, vice-president; H. C. Wenner, secretary, and F. B. Dutton, general superintendent. Directors: J. L. Replogle, H. S. Endsley, Harry Payne Whitney, Charles MacNeill, James J. Flannery, J. Rogers Flannery, L. W. Baldwin, I. Townsend Burden and L. G. Waring.

PRATT & LAMBERT, INC., varnish makers, Buffalo, N. Y., have elected the following officers and directors for the coming year: W. H. Andrews, chairman of the board; J. H. McNulty, president; J. N. Welter, vice-president; J. B. Bouck, Jr., secretary and treasurer; A. C. Bedford, C. M. Pratt, F. W. F. Clark, R. F. Clark, S. N. Griffiths and J. P. Gowing, directors. On January 3 this company held its biennial convention at Buffalo, about 75 salesmen and executives attending the meetings and discussing new developments in the chemistry of varnish-making and better methods of marketing the firm's products.

THE GENERAL ROOFING MANUFACTURING COMPANY, St. Louis, Mo., announces that it purchased the Mound City Paint & Color Company and the Gregg Varnish Company of St. Louis, and also the Lockport Paper Company of Niagara Falls, N. Y., on February 1, and that a new corporation had been organized to be known as the Certain-teed Products Corporation. The new company is capitalized at $25,000,000, of which there will be issued $3,500,000 first preferred 7 per cent cumulative stock, $1,925,000 second preferred seven per cent cumulative convertible stock and 60,000 shares of common stock. The following officers were elected: George M. Brown, president; Smith E. Allison, New York City; Audenrid Whittemore, Chicago; J. S. Porter and J. F. Schlafly, St. Louis, vice-presidents; J. C. Collins, St. Louis, secretary and treasurer, and Clinton Brown, assistant secretary and treasurer. All were formerly officials of the General Roofing Company. While the General Roofing Company already has offices in nearly all of the large cities, three more will be added to the list and several old ones enlarged. The new offices will be in Buffalo, N. Y., Milwaukee, Wis., and Salt Lake City, Utah. The headquarters of the company will remain in St. Louis as at present.



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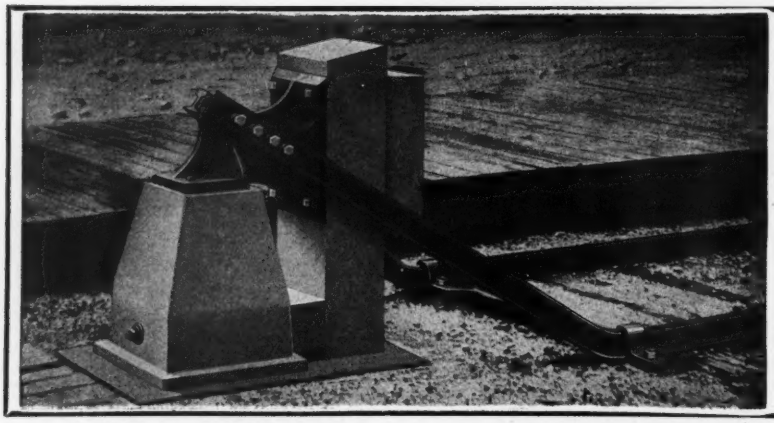

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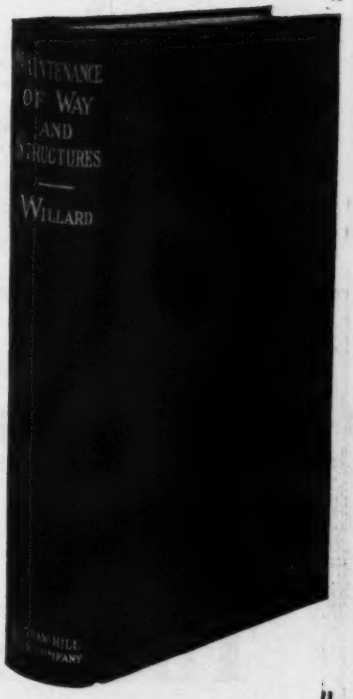

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You may send me for 10 days' free examination:
Willard—Maintenance of Way and Structures, $4.00 net
I agree to pay for the book or return it, postpaid, within 10 days of receipt.

Signed----------

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Name of Railway----------

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CONCRETE

THE
BEST PIPE
FOR
RAILROAD CULVERTS
WHETHER FROM THE STANDPOINT OF
COST, INSTALLATION OR MAINTENANCE
IS

"QUALITY" "ECONOMY"

REINFORCED CONCRETE
"STRENGTH OF CAST IRON AT ONE-THIRD THE COST"

CONCRETE PRODUCTS COMPANY OF PITTSBURGH
DIAMOND BANK BUILDING
PITTSBURGH, PA.

CONCRETE

The Sign

of superiority in good Galvanized Sheets is the well known APOLLO stencil.

The Proof

of excellence is found in its uniform quality, workability, and ability to give greatest service.

There is no evidence like actual experience. The Keystone Copper Steel alloy base used in *Apollo-Keystone* Galvanized insures added durability and rust-resistance for Culverts, Roofing, etc.

AMERICAN SHEET & TIN PLATE CO.
APOLLO
BEST BLOOM
TRADE MARK REGISTERED
PITTSBURGH
KEYSTONE
COPPER STEEL

American Sheet and Tin Plate Company
GENERAL OFFICES: Frick Building, PITTSBURGH, PA.

DISTRICT SALES OFFICES:
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C. F. MASSEY COMPANY

NEW YORK CHICAGO SPOKANE

A three-span pile trestle using Massey Standard Slabs and Octagonal Piles. The use of Massey concrete piles and slabs reduces the expenses of handling to a minimum and does away with waste. This type of construction is being used by all leading railroads.

Massey products are permanent, fireproof, economical, and require absolutely no maintenance. They are made in modern well-equipped plants and of the best material procurable.

The advantageous location of our factories enables us to ship to all points at a low freight rate and the large stock of standard products carried at each factory insure prompt deliveries.

Information and prices on our piles, bridge slabs, cattle passes, culvert pipe and other products will be furnished interested parties on application.

Our Factories are Located as follows: **Newark, N. J.** **Chicago, Ill.** **Memphis, Tenn.** **Anna, Ill.** **Kansas City, Mo.** **Meridian, Miss.** **Minneapolis, Minn.** **Spokane, Wash.**

A Realization of the Labor Saving Capacity and Economy of

"IMPERIAL" TIE TAMPERS

Led to their Adoption by these Railroads

These Pneumatic Tampers are being used in all kinds of ballast with equally satisfactory results. A better riding and more permanent roadbed is secured at a much lower cost—and the labor shortage problem has been eliminated.

They are operated both from "Imperial" Portable Compressor Cars and from switch and signal air lines.

D. L. & W. R. R.
Pennsylvania
Erie R. R.
N. Y. O. & W.
B. & A. R. R.
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C. R. R. of N. J.
B. R. & P. R. R.
B. & O. R. R.
N. Y. N. H. & H.
Canadian Pacific
A. T. & S. F.
Chicago & G. W.
N. Y. C. & St. L.
Illinois Central
P. & L. E.
L. S. & M. S.
C. N. O. & T. P.
Virginian Ry.
B. & L. E.
P. & R. Ry.
N. Y. Central
Lehigh Valley
Wash. Terminal
Tri City Ry. Co.
Grand Rapids Ry.

You will be interested in Bulletin 9023

"Imperial" Pneumatic Tampers on the Pennsylvania

INGERSOLL-RAND COMPANY
11 Broadway, New York
Offices the World Over

46-TT

QUALITY FIRST

What do the words "Creosote Oil" really mean?

The words "Creosote Oil" once signified and were universally accepted as describing a distillate of Coal Tar.

At the present time this once distinctive designation is applied to mixtures of Creosote and Tar, Creosote and Petroleum, Creosote and Asphalt and other compounds that are sold under the name "Creosote Oil."

No mixture possesses the permanent qualities of a pure, high-gravity, high-boiling point, stable Creosote Oil, and there is a wide variation in their preservative values.

To obtain the full mechanical life of Street Paving Blocks, Bridge Timbers and Bridge Floors, Telegraph and Telephone Poles, Cross-Arms, Piling and Cross-Ties the preservative must be pure, stable, of deep penetrance, insoluble in water and unaffected by extremes in temperature.

There is but one way to be sure of getting Creosote Oil of purity, stability, high specific gravity and high-boiling point that will be free from every kind of adulterant and that is by the adoption of specifications that will provide for

REILLY Improved CREOSOTE OIL

The Most Effective Wood Preservative

FOR OPEN TANK AND BRUSH TREATMENT

Reilly Improved Carbolineum is economical, effective and permanent.

REPUBLIC CREOSOTING COMPANY

Principal Offices: INDIANAPOLIS, IND.

PLANTS:

INDIANAPOLIS MOBILE MINNEAPOLIS SEATTLE

Send Us Your Old Boiler Tubes

Just rattle them clean of scale and soot and send them on. At a very reasonable cost we'll fabricate them and

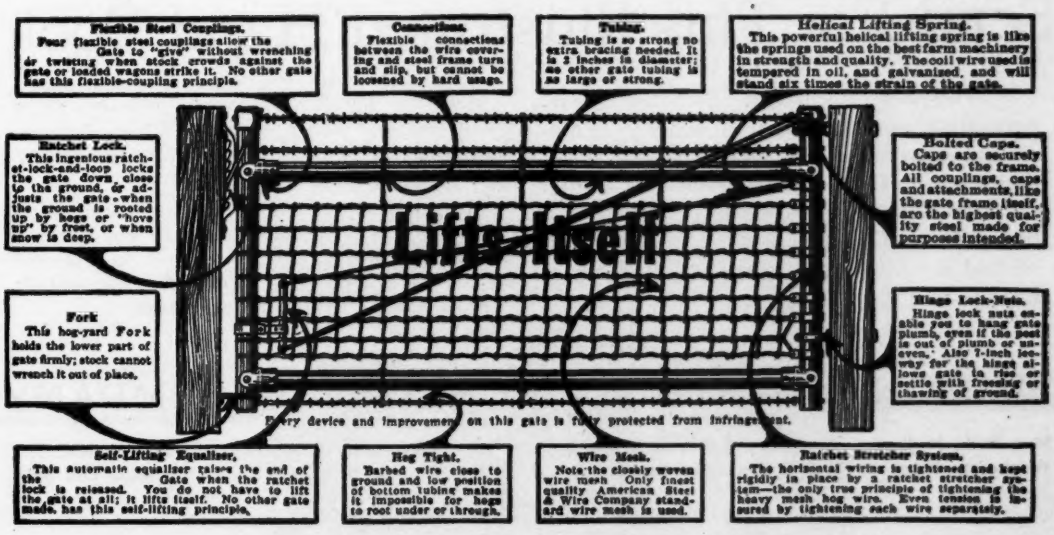
We'll Return Them To You As Splendid Right-of-Way Gates

Our proposition is simple and, to you, economical. It offers you a way to dispose profitably of your discarded locomotive boiler tubes and to renew your Right-of-Way Gates at small cost.

Write today for detailed proposition and bulletin illustrating our gates

This is One of Our Gates

It is "Bull-Strong," "Pig-Tight," extremely serviceable and attractive.


Flexible Steel Couplings.
Four flexible steel couplings allow the Gate to "give" without wrenching or twisting when stock crowds against the gate or loaded wagons strike it. No other gate has this flexible-coupling principle.
Connections.
Flexible connections between the wire covering and steel frame turn and slip, but cannot be loosened by hard usage.
Tubing.
Tubing is so strong no extra bracing needed. It is 2 inches in diameter; no other gate tubing is as large or strong.
Helical Lifting Spring.
This powerful helical lifting spring is like the springs used on the best farm machinery in strength and quality. The coil wire used is tempered in oil, and galvanized, and will stand six times the strain of the gate.
Ratchet Lock.
This ingenious ratchet-lock-and-loop locks the gate down close to the ground, or adjusts the gate when the ground is rooted up by hogs or "hove up" by frost, or when snow is deep.
Bolted Caps.
Caps are securely bolted to the frame. All couplings, caps and attachments, like the gate frame itself, are the highest quality steel made for purposes intended.
Lifts Itself
Fork
This hog-yard Fork holds the lower part of gate firmly; stock cannot wrench it out of place.
Hinge Lock-Nuts.
Hinge lock nuts enable you to hang gate plumb, even if the post is out of plumb or uneven. Also 1-inch leeway for the hinge allows gate to rise or settle with freezing or thawing of ground.
Every device and improvement on this gate is fully protected from infringement.
Self-Lifting Equalizer.
This automatic equalizer raises the end of the Gate when the ratchet lock is released. You do not have to lift the gate at all; it lifts itself. No other gate made has this self-lifting principle.
Hog Tight.
Barbed wire close to ground and low position of bottom tubing makes it impossible for hogs to root under or through.
Wire Mesh.
Note the closely woven wire mesh. Only finest quality American Steel & Wire Company standard wire mesh is used.
Ratchet Stretcher System.
The horizontal wiring is tightened and kept rigidly in place by a ratchet stretcher system—the only true principle of tightening the heavy mesh hog wire. Even tension is insured by tightening each wire separately.

Kansas City Steel Gate Factory

Kansas City, Missouri

To Manufacturers Of . . . . . .

Track Tools, Track Scales, Rails and Track Fastenings, Tracks and Switches, Ties (treated and untreated), Bridge and other Structural Materials, Water Tanks, Coaling Station Apparatus, Crossing Gates and Bells, Freight Handling Machinery, Hand and Inspection Cars, Machinery or Appliances for heating or ventilating railway stations or shops, Material for killing weeds, Devices for Melting or Removing Snow, Preservative Paints for Bridges and Buildings, Railway Signals and their accessories, Wire, Batteries, Battery Vaults, Signal Lamps, etc.

Send For This Illustrated Hand Book

It gives full information about the annual convention of the American Railway Engineering Association, the Spring meeting of the Railway Signal Association and the exhibit of railway appliances to be made by the National Railway Appliances Association, all to be held in Chicago during the week beginning March 19.

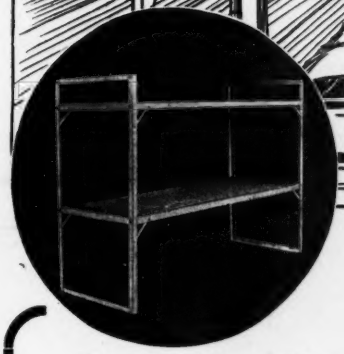
Also, the handbook gives full information about the four Daily editions of the Railway Age Gazette to be published in Chicago during that week.

The booklet is intended only for manufacturers of those things which railway engineering department officers buy, and the supply is limited. Better send for a copy before the edition is exhausted. We make no charge.

SIMMONS-BOARDMAN PUBLISHING COMPANY

New York, N. Y.	Chicago, Ill.	Cleveland, O.	Washington, D. C.
Woolworth Bldg.	Transportation Bldg.	Citizens Bldg.	Home Life Bldg.

The Railway Age Gazette is a Member of the Audit Bureau of Circulations.



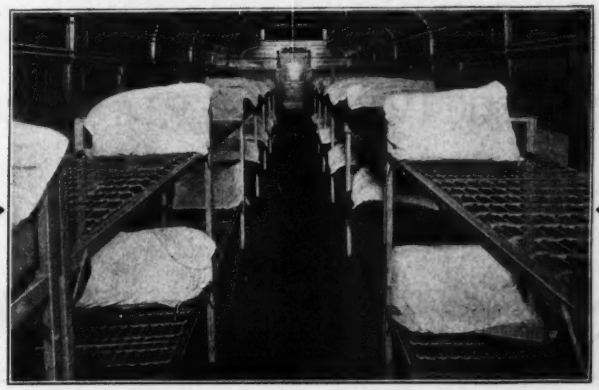
Where Comfort Would Bring Contentment

To be frank, good labor is growing scarcer every day. This is true, especially in getting work-train crews. And then to hold your men after you get them. That's the perplexing question.
Clean, comfortable sleeping quarters will help to make your men contented; that's half the battle; for comfort often brings contentment. Some of the large eastern railroads have installed

Romelink All-Metal Bunks In Work Trains

They find that it pays to keep their men contented and comfortably housed; they now find that a well-rested workman can do a better day's work—besides, they are steadier.
Romelink All-Metal Bunks are a paying investment for any railroad and far cheaper than vermin-catching wood bunks.
Romelink All-Metal Bunks are sanitary—not a crevice for vermin to collect and breed; furthermore, they can be easily and quickly cleaned. Add to that the fact that all castings are malleable (not chilled) iron—all springs are sagless and galvanized to prevent rusting—entire frame hand-riveted, hence, no bolts to loosen, then you will understand why the United States Government used about 20,000 Romelink Bunks down at Panama; why the Bethlehem Steel and Du Pont Powder Companies use a large number; why railroads are realizing the importance of Romelink Bunks for wrecking trains and work-train crews.
Let us take up with you the requirements for your problems.

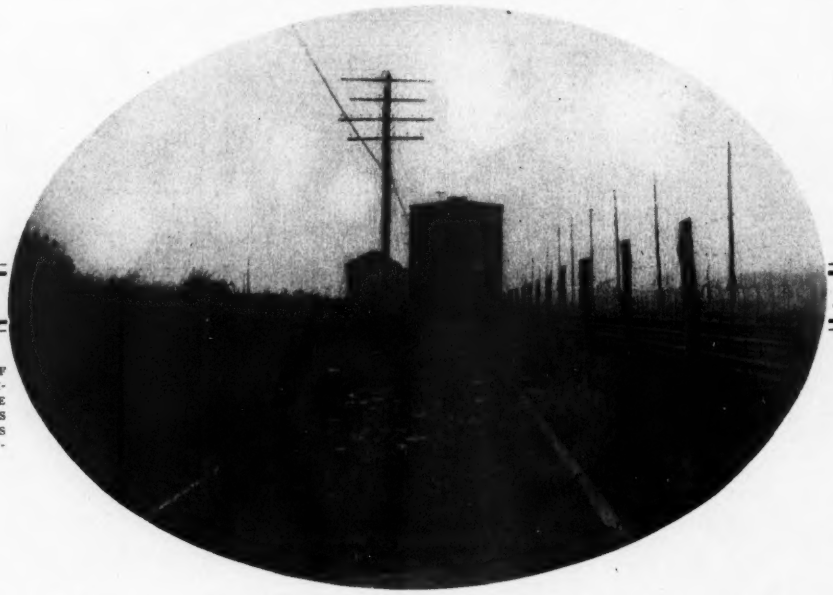
Southern-Rome Company
617-633 West Pratt Street, Baltimore, Md.



Every Maintenance of Way Man ought to study the condition of this track—before

TRACKOLINE
KILLS EVERY WEED TOP ROOT & SEED

Was Applied



CONDITION OF TRACK IMMEDIATELY BEFORE "TRACKOLINE" WAS APPLIED. WEEDS AND GRASS EVERYWHERE.

HERE is a striking example of the efficiency of TRACKOLINE, *the Weed Killer.* This manure siding on which the growth was so rank that it necessitated *hand weeding five times each season.* Eighteen inches high stood these tough old weeds when TRACKOLINE was applied. Result—in a week's time the weeds were all dead, and what is more, *the track remained absolutely clean for the balance of the season.*

You know the power of manure to make weeds grow, then reflect on the power of TRACKOLINE not alone to make weeds *go.* Not only to kill the old tough weeds, but to exterminate the seedlings as well, and prevent even the power of manure to cause them to germinate.

Trackoline is a highly concentrated chemical for the destruction of weeds. It not only kills them for the season, but retards their growth the following season.

Trackoline, conceded by expert Maintenance Officials to be a *real* herbicide, is absolutely harmless to live stock, causes no injurious results to rails, ties or track superstructures and *needs no* costly equipment for its effective application.

Send today for "Trackoline Tracts," fully describing this Scientific, yet Most Practical, Method of preventing the growth of vegetation.

I am interested in clean tracks and lean expenditures for securing them. Please mail me Trackoline Tracts and full particulars of Trackoline, The Weed Killer.

Name.....

Position.....

Address.....

PROTECTIVE MATERIALS CORPORATION

Vanderbilt Building, 51 East 42nd Street

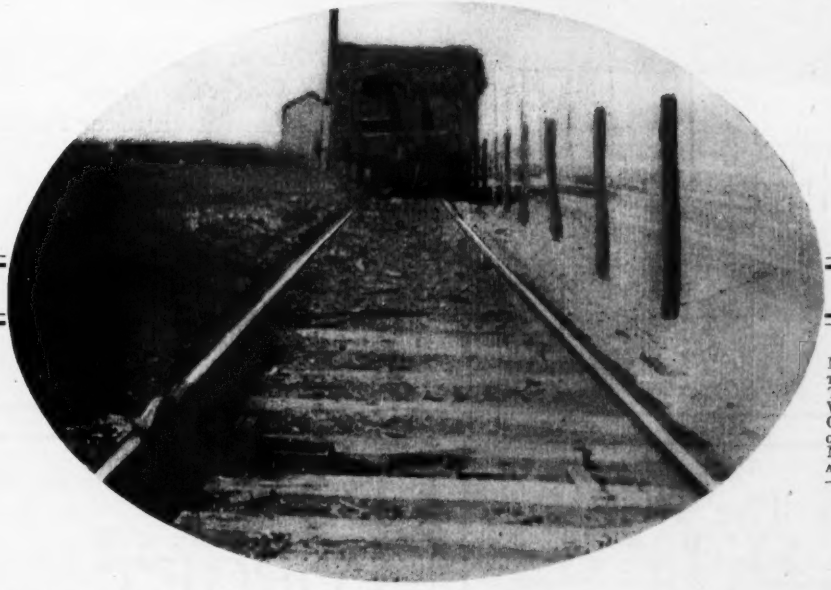
NEW YORK, N. Y.

TRACKOLINE
KILLS EVERY WEED TOP ROOT & SEED

Every Maintenance of Way Man ought to investigate a weed killer that can produce this result—after

TRACKOLINE
KILLS EVERY WEED TOP ROOT & SEED

Did Its Work



NOTE THE CONDITION OF THE SAME TRACK NINE WEEKS AFTER ONE APPLICATION OF TRACKOLINE. NO WEEDS HERE, AND WHAT IS MORE — NO COME-BACK OF FOLIAGE.

TRACKOLINE is scientifically compounded to accomplish certain definite results—to kill every weed top, root and seed, and more—Trackoline has accomplished this definite result for hundreds of others and will accomplish it for you.

Remember the present scarcity of labor and its excessive cost. Reflect on how both weeds and costs came up last year. What is to prevent a similar result this year? What will keep both down this season? Is that your problem? Then here is your answer, TRACKOLINE.

Note the picture above. Reflect how TRACKOLINE defied the natural force of manure on this siding. How it sterilizes the soil and prevents growth of any form of vegetation. Think what that will mean to your road in money saved, and improved drainage, and send now for full particulars of TRACKOLINE, the Weed Killer, the efficiency of which is guaranteed both by us and by the actual results so many others have obtained through its use.

The Spring rains will soon start the weeds growing on that right-of-way of yours, and more—the heavy expense previous methods of destroying them have entailed. Right now, before the weeds and expense start growing, is the time to send for "Trackoline Tracts," the book which points the way to clean track and lean expenditure.

PROTECTIVE MATERIALS CORPORATION

Vanderbilt Building, 51 East 42nd Street

NEW YORK, N. Y.

TRACKOLINE
KILLS EVERY WEED TOP ROOT & SEED

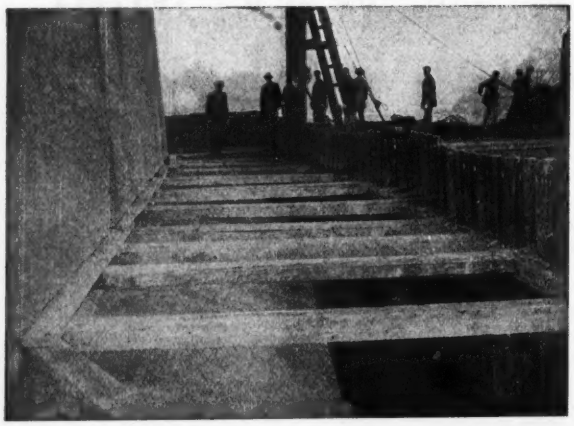
I am interested in clean tracks and lean expenditures for securing them. Please mail me Trackoline Tracts and full particulars of Trackoline, The Weed Killer.

Name.....

Position.....

Address.....

Steel for Service



In this cofferdam for a B. & O. S. W. Bridge at Loveland, Ohio,

United States Steel Sheet Piling

was driven into soapstone and shale river bottom from 18 in. to 3 ft.

After the cofferdam was unwatered, all that was necessary to take care of the leakage was a 1½-inch siphon.

Further, when pulled, the piling was practically as good as new.

There are three very important points to be considered when selecting a type of sheet piling:—

Ease of Driving
Watertightness
Condition after Pulling

Such jobs as the above prove the excellence of United States Steel Sheet Piling.

Carnegie Steel Company

General Offices—Pittsburgh, Pa.

769

Eliminate The Three R's

Repairs, Renewals and Repainting. Those are the three R's which increase maintenance cost where metal gutters are used. Those are the three items of expense which *banish* from the expenditure budget when you use

E. M. LONG & SONS CADIZ OHIO IMPROVED O.G FIR GUTTERS

O. G. FIR GUTTERS

Smoke, water or chemical fumes do not affect O. G. Fir Gutters because they are made of straight grained, pitch free, decay resisting wood, Nature's Own Gutter Material —Douglas Fir.

O. G. Fir Gutters are built right into the building or can be attached afterward, in either case making a strong, durable job which is impossible with metal gutters.

O. G. Fir Gutters effect double savings, which is why the railroads specify them. Send for booklet explaining fully why they are specified by eight leading railroad systems.

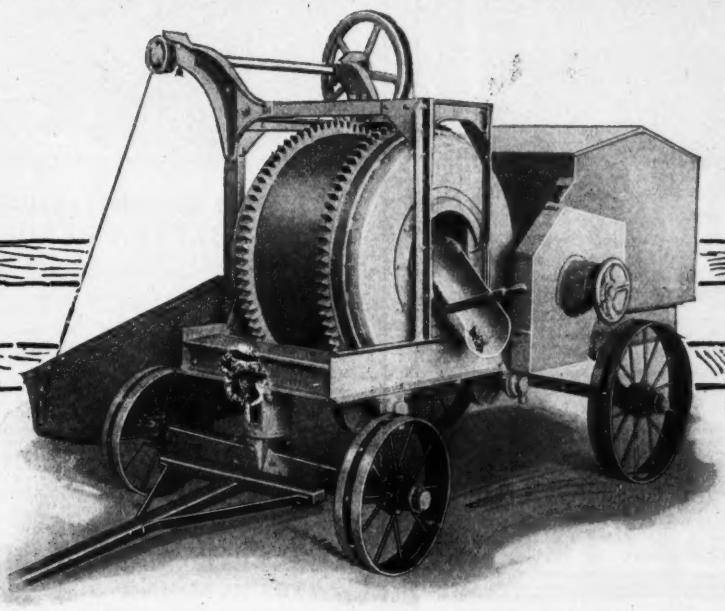
E. M. LONG & SONS
CADIZ - - - - OHIO

DON'T FORGET THAT CONTEST

What Contest?

See Editorial Announcement

Railroad Construction Work Requires Railroad Equipment



Railroad requirements, railroad service, have been carefully kept in sight in the design and construction of the

DANDIE MIXER

Dandie Mixers are ideal for concrete jobs of from 5 to 10 cubic feet batches, and are equally adaptable to projects of various sizes. They give efficient, economical service on jobs running from a station foundation to a bridge abutment.

In designing the Dandie Mixer simplicity without sacrifice of strength has been the aim, and in the Dandie line the railroads have found not only a mixer adapted to their service—light-weight, strong, durable and compact—but a mixer of quality and merit, which assures that entire unit efficiency for which all Koehring Mixers bear a well-earned reputation.

In your consideration of a company concrete organization, due thought must be given the mixer, which is a vital feature in its success. In solving this problem of low cost and best results, the services of our engineers and the advantage of our broad experience are at your disposal. Write us fully and send for facts on the mixer of strength, service and saving. Know what **"entire unit efficiency"** will mean for that road of yours.

Koehring Machine Company

Milwaukee, Wis.

DANDIE MIXER

Marion

Steam Shovels, Dredges, Draglines and Kindred Machinery

WHEN someone says "See America First" you immediately think of the Great Northern Railway; in just the same way do the officials of that famous system think "Marion" in connection with the terms "Ditching Machines," "Steam Shovels," or any kind of "Excavating Machinery."

For the Great Northern Railway and The Marion Steam Shovel Company are business friends in the strictest sense;—

Marion Ditchers and Marion Shovels Do "Great Northern's" Big Work

and small work, too—whether it's constructing new lines or opening up ditches along existing rights-of-way.

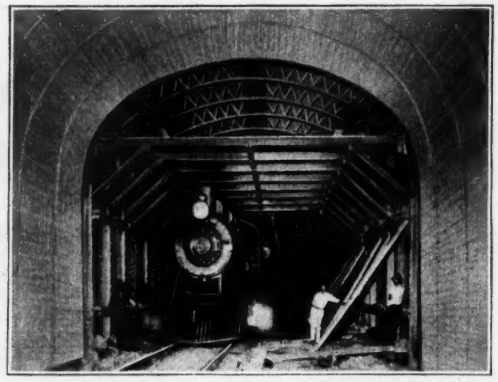
May we suggest that an investigation might develop just as interesting possibilities for using "Marions" in your own work?

We should heartily welcome that, and will gladly assist you in making it. Your request for particulars will not obligate you.

The Marion Steam Shovel Company, Marion, Ohio

Branches: Atlanta, Chicago, New York, Philadelphia, San Francisco, Seattle

225 ESTABLISHED 1884



RAPID WORK—LOWER COST BETTER RESULTS AND NO DELAY IN TRAFFIC

These are some of the advantages secured by railroads that line tunnels by the

Pneumatic Method of Mixing and Conveying Concrete
(Patented)

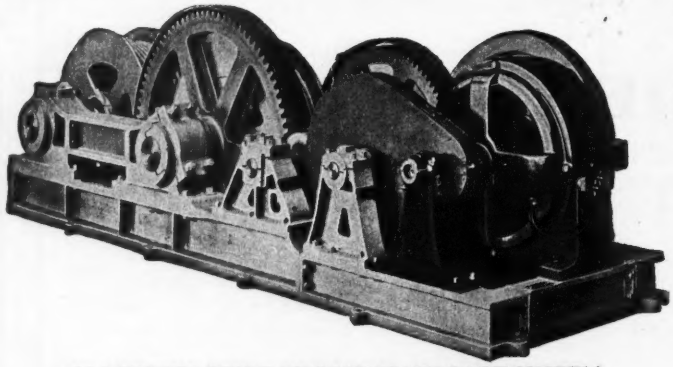
Labor cost and time are reduced to one-third. Less equipment is required—No other mixer, no cars, no tracks, no elevated platforms, no locomotives.

Tests of small blocks taken at random from the Wilson Avenue Tunnel, Chicago, for testing, proved, not alone their exceeding density, but in many cases proved so hard that the equipment of the Underwriters' Laboratory could not crush them.

Used by C. B. & Q. and other leading roads. They secure better work at half the cost of other methods.

We lease equipment, or do work on contract.
Send for descriptive literature.

CONCRETE MIXING & PLACING CO.
123 W. Madison St. - - CHICAGO



ALL HOISTS BUILT ON DUPLICATE PART SYSTEM

LIDGERWOOD CAR HAUL

Endless Rope Electric Car Haul Hoist. Pull 17,500 lbs. at 75 F. P. M. Built for Pennsylvania R. R. Co.

We build hoists suitable for every character of railroad work

Write for Catalogues

Lidgerwood Mfg. Company
96 LIBERTY ST., NEW YORK

Chicago Philadelphia Pittsburgh Seattle London, Eng.

2

STONE BALLAST CLEANING

Can be done and is being done on some of the best railroads in the country at a saving of 56% by the use of the

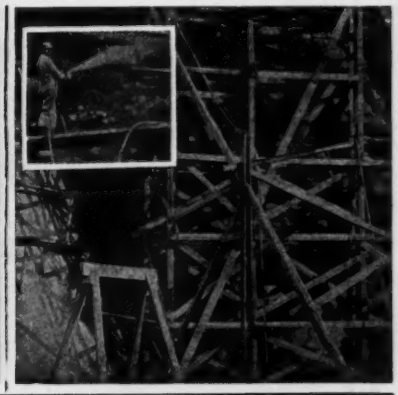
TRENCH-ZEPP STONE BALLAST CLEANER

Such economy well deserves your investigation.

Write for booklet of cuts and a copy of the latest report on Stone Ballast Cleaning by this new method.

LITTLEFORD BROS.

MANUFACTURERS CINCINNATI, OHIO SOLE AGENTS



Have You Similar Problems?

HAVE you a million square feet of steel to be coated with concrete? Perhaps not! But you surely have construction and repair work where you could save labor and money. Undoubtedly you have loose rock cuts, bridge girders that need fireproofing, undersides of bridge floors that should be protected from smoke, gases and blast action from passing trains. These jobs make maintenance costs jump. Big economies in just such work can be secured with the

CEMENT-GUN

Engineers all over the country have found that its use means greater ease and marked economies in doing their concrete work. We should be pleased to go into the details of the Cement-Gun with you.

GUNITE

Gunite, the product of the Cement-Gun, defies the elements. Even severe vibration will not loosen or cause it to crack. In short, Gunite is stronger in bond, more impervious and of a quality impossible to attain by hand or any other machine process.

Remember that the Cement-Gun can be purchased outright from us by anyone, as it is not a restricted article. Shall we send you the complete story?

LOOK FOR OUR EXHIBIT AT THE COLISEUM. BOOTH No. 164½.

Cement-Gun Co., Inc.

South 10th and Mill Streets
Allentown, Pa.

New York Office, 30 Church St.

V. C. Byers, 1414 Fisher Bldg., Chicago, Ill.
John A Taylor, New House Bldg., Salt Lake City, Utah
Taylor Engineering Co., 638 Central Bldg, Seattle, Wash.
Taylor Engineering Co., Vancouver, B. C.
A. R. Roberts, 727 Traders Bank Bldg., Toronto, Ont., Can.

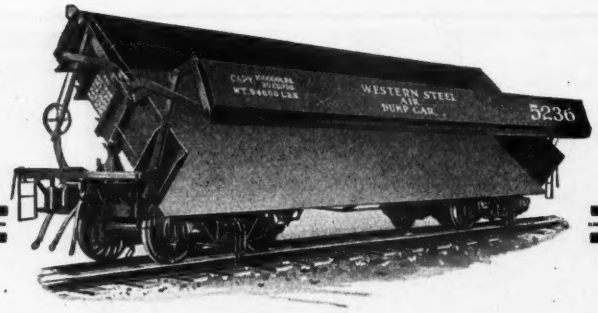
FILL IN AND MAIL TODAY

Cement-Gun Co., Inc.,
Allentown, Pa.

Gentlemen: I am interested in the Cement-Gun for use in.....

Name.....

Address.....



Cut Your Ditching Costs In Half

How to keep down Ditching Costs is a problem which every practical Railroad Man is trying to solve. We are stating a tested fact, when we tell you that by the use of two

Western Air Dump Cars

with your Ditching Machine between, you can cut your ditching costs in half. It can be done and it has been done.

A Mobile & Ohio Roadmaster, by substituting two Western Air Dump Cars for the old way of Plow Unloading, reduced his Ditching Costs 44 per cent and increased his monthly output 25 per cent.

By handling material in two Western Air Dump Cars, thus saving much of the cost of unloading, a large Western Railroad reduced its Ditching Costs 60 per cent.

The Georgia & Florida Railway, after a careful test, using a Ditcher and two Western 20-yd. Air Dump Cars, found that ditching was costing only 14.04 cents per yard.

The Atlanta, Birmingham & Atlantic Railway, by using two Western Air Dumps with a Ditcher, cut their Ditching Costs from 22 cents to about 14 cents per cubic yard.

An officer of another railroad, after a satisfactory test of Western Air Dumps, with its Ditcher Outfit, writes: "We are loading an average of 24 cars per day, 15 yards to the car. Based on an average of 22 working days, we are handling about 8,000 cubic yards per month at a cost of $1,120, not including per diem accruing on Ditcher and Locomotive. This makes a yard cost of 14 cents."

The "Western" has solved ditching problems, because it satisfies in low initial cost, stays on the track, can be operated at high speed, dumped instantaneously, and is built to stand the abuse such equipment receives.

Send for our free book, "Cycles of Cost and Operation." It is full of helpful facts and figures relative to cost reductions.

WESTERN WHEELED SCRAPER COMPANY, Aurora, Illinois

This was a bad one

Now it is a good one

Because It Was Re-threaded With National Lock-Joint Cast-Iron Pipe

Look These Facts In The Face
Before You Face Your Next Culvert Renewal Problem

How about your Culvert Renewal Expense for 1916?

Rather a good-sized item, was it not?

How about your Culvert Renewal Expense for 1917, 1918, etc., etc.? Looks as if that item in your annual maintenance budget was to be a source of annual regret, is that it?

Then hark! That heavy item is unnecessary, should be, **can be**, cut out; that is, reduced each year till it practically disappears. "Going! Going! Gone!" That's it exactly, "Now You See It and Now You Don't." Sounds like magic, but it is not. It is just sound engineering sense applied to culvert problems, and

National Lock-Joint Cast-Iron Pipe

installed for your culverts, that's all; but how it saves money in annual culvert renewals.

Right now, before you face your next culvert renewals, look these facts in the face.

National Lock-Joint Cast-Iron Pipe, made from remelted Alabama Pig Iron, is as permanent as your roadbed. It comes in short lengths (3, 4 and 5 ft.) that means easy handling. Those little old section gangs of yours will install it without accessory of any kind and without interfering with traffic. Re-thread the old culvert and back fill with cement—that's all; and, what is more, that's all you will hear from that culvert. See how the renewal expense vanishes, growing less each year.

And now, one last word. It is sold by the foot, first cost is low, before you know it you will have **no** Culvert Renewal Problem—"Going! Going! Gone!" The Renewal Expense, Not the Pipe. *Now you see it.*

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Chicago Office: - Peoples Gas Building
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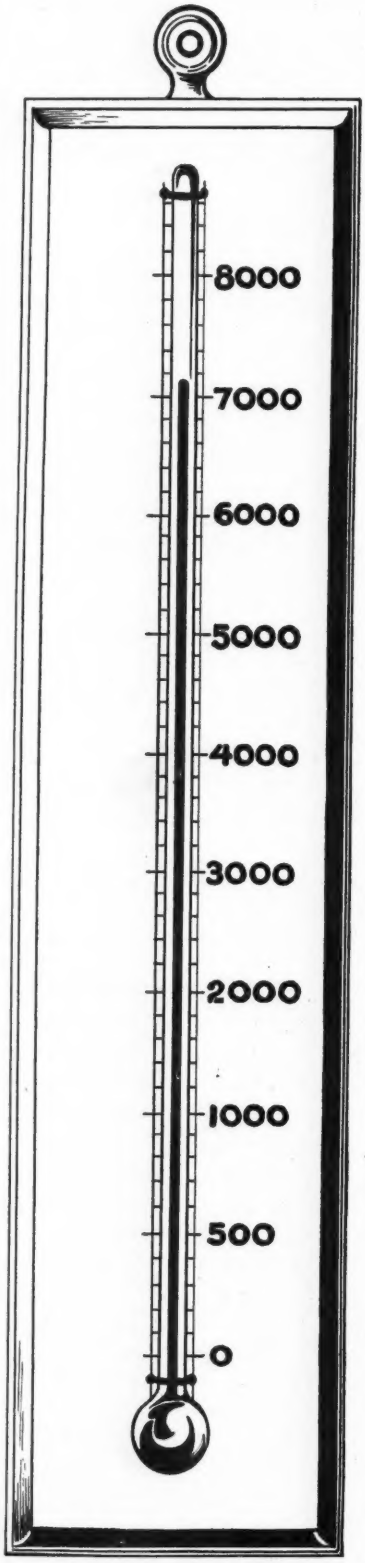

Watch It Climb!

Going Up!

THE figures on the scale correspond with the number of paid subscribers to the *Railway Maintenance Engineer*. When the 8,000 mark will have been reached the rates for advertising will be advanced approximately 25 per cent. The schedule now in force was based on an initial circulation of 4,000 copies a month.

As the *Railway Maintenance Engineer* goes to the very class of men who have to do with specifying and buying those things over which the maintenance of way department has absolute control, the use of its pages is essential to any sales' campaign. The names of more than 80 per cent. of them cannot be found in any printed list nor on any office mailing list. Better contract for space and service now and protect yourself against the rising market.

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